Environmental Operating Guidelines

for the

Alberta Petroleum Industry

Prepared by the

Canadian Petroleum Association

September 1988

90-04764/

ACKNOWLEDGEMENT

The Environmental Operating Guidelines Handbook was initiated in 1977 by the Research Advisory Council of the Canadian Petroleum Association under the chairmanship of Mr. Ron Findlay, of Amoco Canada Petroleum Company Ltd. The objectives of the project were carried out through a Steering Committee chaired by Mr. Ernie Cudby, of Chevron Standard Limited which resulted in the first handbook being published in 1980.

David Bromley Engineering Ltd. has been involved as principal authors of the handbook in the original publication and with the updates of 1982, 1984 and the recent major update of 1988.

We are indebted to a great many individuals, organizations and companies for information and assistance in the preparation of the recent edition of the handbook. This particular update has been extensive and has required the dedication of numerous individuals.

Special thanks is due to Mr. Ed Brushett, Ms. Cheryl McKay, Mr. Roger Creasey and Mr. Ivan Weleschuk of the Energy Resources Conservation Board; Mr. Ralph Dyer, Mr. Neil Wandler, Mr. Jerry Lack and Mr. Paul Chaikowsky of Alberta Environment; Mr. Adolf Bruneski and Mr. Howard Townsend of Alberta Forestry, Lands and Wildlife; and Mr. Peter Blackall of Environment Canada.

The time and energy of the 1987/88 Environmental Operating Guidelines Subcommittee of Canadian Petroleum Association have been extensive. The committee's generous contribution of time, effort and patience was essential to ensure that the document was properly focused, and responsive to industry's needs. This sub-committee was chaired by Mr. Mark Lesky of Husky Oil and involved Mr. George Collin of Petro Canada, Mr. Ron Findlay of Amoco Canada, Mr. Paul Coleman of PanCanadian, Mr. Cal Sikstrom of Esso, Mr. Evan Birchard of Esso, Mr. Bob Seager of Nova and Mr. Dallas Zaretsky of Amoco Canada.

It is hoped the handbook will provide the user with a document that provides a basis upon which both industry and government can develop sound environmental management.

Environmental Operating Guidelines

For the

Alberta Petroleum Industry

Sponsored
By The

THE CANADIAN PETROLEUM ASSOCIACTION

September 1988

Prepared By

David Bromley Engineering (1983) Ltd.

TABLE OF CONTENTS

1.0 INTRODUCTION

2.0 ENVIRONMENTAL REGULATORY PROCESS

3.0 EXPLORATION: GEOPHYSICAL SURVEYS AND EVALUATIONS

4.0 DRILLING: EXPLORATION AND DEVELOPMENT

5.0 CONVENTIONAL OIL AND GAS PRODUCTION FACILITIES

6.0 PIPELINES

7.0 IN SITU HEAVY OIL FACILITIES

8.0 DEVELOPMENTAL/OPERATIONAL ACTIVITIES

- 8.1 Access Roads
- 8.2 Stream Crossings
- 8.3 Sand, Gravel and Borrow Pit Operations
- 8.4 Reclamation and Conservation
- 8.5 Camps and Camp Operations
- 8.7 Waste Handling
- 8.8 Noise
- 8.9 Emergency Procedures and Contingency Plans
- 8.10 Abandonment and Decommissioning
- 8.11 Pesticides, Herbicides and Chemical Handling
- 8.12 Environmental Audit
- 8.13 Public Participation

APPENDICES

Appendix A1 Legislation

Appendix A2 Municipal Bylaws

Appendix B Maps and Directories for Environmental Parameters

Appendix C Contacts

Appendix D Permits, Licences amd Approvals

Appendix E Glossary

Appendix F References

Appendix G Concordance (Key Word Index)

Appendix H Abbreviation Key

Section 1.0

TABLE OF CONTENTS

1.0 INTRODUCTION
- 1.1 Contents of the Handbook
- 1.2 Updates

LIST OF TABLES

Number	Title
1.1	Environmental Code of Practice for The Canadian Petroleum Association

ENVIRONMENTAL OPERATING GUIDELINES
FOR THE
ALBERTA PETROLEUM INDUSTRY

1.0 INTRODUCTION

The Canadian Petroluem Association (CPA) recognizes the importance of environmental protection and the necessity to promote a consistently high level of environmental performance in the exploration for and production of oil and gas. In pursuit of this objective, member companies have established an Environmental Code of Practice which is a commitment to protect the environment and maintain public health and safety during all phases of exploration and production.

The Environmental Code of Practice is presented in Table 1.1

This handbook. Environmental Operating Guidelines for the Alberta Petroleum Industry is designed to assist member companies in the implementation of the Code of Practice. Athough the handbook reflects the thoughts of many individuals who have contributed to the development of the document, companies may prefer alternative designs and procedures which reflect specific operating and site conditions. Alternative approaches therefore are encouraged, if they are environmentally acceptable to maintain public health and safety, and satisfy the intent of the Environmental Code of Practice.

The handbook recognizes that few, if any Users, have access to all of the many guidelines, regulations, and standards which are environmentally pertinent to the petroleum industry in the Province of Alberta. The handbook therefore, provides a "starting point" from which the User can undertake action, acquire additional reference material or contact industry or government personnel for further assistance. It also serves as a "tool" to both the industry and regulatory bodies to develop a consistent approach to environmental analysis and control.

The handbook does not supercede or replace existing guidelines, regulations or standards. It is intended to help the User to find information easily.

The handbook was first written in 1980 and the enclosed document represents the third update. This update has been a major one with a new format and the addition of up-to-date information.

1.1 CONTENTS OF THE HANDBOOK

The handbook commences with **Section 2.0 "Environmental Regulatory Process"** which describes all of the main regulatory bodies and the various divisions and approval procedures that make up these bodies.

Sections 3.0 to 7.0 deal with specific types of oil and gas activity. Application procedures, permits and approvals, and specific environmental guidelines are addressed in each section. The specific development activities are:

Section 3.0 **"Exploration: Geophysical Surveys and Evaluation"**

Section 4.0 **"Drilling: Exploration and Development"**

Section 5.0 **"Conventional Oil and Gas Production Facilities"**

Section 6.0 **"Pipelines"**

Section 7.0 **"In Situ Heavy Oil Facilities"**

Section 8.0 **"Developmental/Operational Activities"** provides guidelines on activities which are an integral part of more than one of the development activities described in sections 3.0 to 7.0 and includes information for:

1. Access Roads

2. Stream Crossings
3. Sand, Gravel and Borrow Pit Operations
4. Reclamation and Conservation
5. Erosion
6. Camp and Camp Operations
7. Waste Handling
8. Noise
9. Emergency Procedures and Contingency Plans
10. Abandonment and Decommissioning
11. Pesticides, Herbicides and Chemical Handling
12. Environmental Audit
13. Public Participation

Following the main text are a series of appendices which can be described as follows:

Appendices A1 and A2 contain a copy of the legislation with respect to environmental matters in Alberta. The legislation covers Provincial Acts and Regulations and Municipal Bylaws.

Appendix B "Maps and Directories for Environmental Parameters" provides maps and directories available for various environmental parameters. The environmental parameters include topography, soils, vegetation, climate, water resources, archaeological resources, existing infrastructure and environmentally unique and protected areas.

Appendix C "Contacts" provides pertinent contacts for the industry with telephone numbers.

Appendix D "Permits, Licences and Approvals" provides copies of all permits, licences and approvals.

Appendix E "Glossary" includes definitions of all terms.

Appendix F "References and ERCB Documents" identifies references used in this handbook.

Appendix G "Concordance (Key Word Index)" provides the User with a key word index for easy access to information within the handbook.

Appendix H "Abbreviation Key" defines abbreviations used in this handbook.

At the front of each of sections 3.0 to 7.0 and each part of section 8.0, there is an **"Environmental Concerns Directory"**. This directory identifies the environmental issues discussed in that particular section and where the information can be obtained in the handbook as well as the regulatory contact for that particular issue.

1.2 UPDATES

The handbook is regularly updated to ensure the material presented reflects the current regulations, best practical technology and current industry practices.

The usefulness of this handbook is dependent upon the accuracy and relevance of the information. To improve the handbook and ensure its effectiveness the User should inform the CPA of inaccuracies, deficiencies and areas requiring improvement. Comments should be forwarded to:

Manager
Environmental and Socio-Econnomic Affairs
Canadian Petroleum Association
3800 - 150 - 6th Avenue S.W.
Calgary, Alberta
T2P 3Y7
Tel: (403) 269-6721

To ensure the User receives the annual updates, a master index of recipients is compiled by the CPA. If the User of the handbook is not properly identified and does not receive the updates, the handbook will become obsolete and ineffective.

TABLE 1.1
ENVIRONMENTAL CODE OF PRACTICE FOR THE CANADIAN PETROLEUM ASSOCIATION

"POLICY STATEMENT"

Companies are committed to protecting the environment and to maintaining public health and safety during all phases of operation of the petroleum industry. They do so on behalf of their shareholders and employees, and on behalf of the present and future generations of Canadians.

GUIDING PRINCIPLES

- Planning - Companies will assess the potential effects of their projects and will integrate protective measures into the planning process to prevent or reduce impacts upon the environment and on public health and safety.
- Consultative - Companies will provide relevant information in a timely fashion to the public and to governments with respect to corporate policies and activities and will be responsive and sensitive to community concerns.
- Compliance - Companies will comply with applicable laws and regulations and will adhere to the intent of industry guidelines.
- Corrective Action - Environmental damage caused by company activities will be corrected in a timely and efficient manner.
- Emergency Response - Companies will implement programs to minimize the consequences of emergency events by ensuring prompt and effective response.
- Research - Companies will encourage and support research relevant to improving industry's ability to protect the environment and public health and safety.

Companies will apply the expertise necessary to implement this Environmental Code of Practice and will require contract services to operate in a manner consistent with corporate policies.

Section 2.0

TABLE OF CONTENTS

2.0 ENVIRONMENTAL REGULATORY PROCESS

- 2.1 Administration of Environmental Acts and Regulations
- 2.2 Energy Resources Conservation Board
  - 2.2.1 ERCB Departments
- 2.3 Alberta Forestry, Lands and Wildlife
  - 2.3.1 Departmental Branches
- 2.4 Alberta Energy
- 2.5 Alberta Environment
  - 2.5.1 Departmental Divisions
- 2.6 Regulatory Procedures for Interprovincial, Federal and Transboundary Activities
- 2.7 General Agreements, Approvals or Permits
- 2.8 Maps of Jurisdictions
- 2.9 Application Procedures and Referral Systems
- 2.10 Public Involvement
  - 2.10.1 Public Hearings
  - 2.10.2 Rural Relations

LIST OF TABLES

Number	Title
2.1	Approvals, Permits and Licences Potentially Required for Petroleum Developments
2.2	ERCB Approvals/Permits/Licences
2.3	AFLW Approvals/Permits/Licences
2.4	Alberta Environment Approvals/Permits/Licences

LIST OF FIGURES

Number	Title
2.1	ERCB Organization
2.2	Alberta Energy/Alberta Forestry, Lands and Wildlife Organization
2.3	Alberta Environment Organization
2.4	Overall Relationship of ERCB, AFLW and AE
2.5	Application Procedures for Development and Reclamation (D & R) Approvals
2.6	Stream Crossing Application Procedure
2.7	Access Road Application Procedure
2.8	Clean Air and Water Acts - Permit to Construct and Licence to Operate - Application Procedure

2.9 ERCB Area Office Inspection Districts
2.10 AFLW Ranger District Map
2.11 Municipalities
2.12 AFLW Regions
2.13 Location of RDA's in Alberta
2.14 Land Conservation and Reclamation Council Districts - Regional Offices
2.15 Water Resources Administration Division - Regional Boundaries

2.0 ENVIRONMENTAL REGULATORY PROCESS

Most environmental matters in Alberta are governed by Provincial Acts and Regulations administered by Provincial agencies. Projects which involve property within Municipal boundaries or on Federal lands can involve a variety of government levels and agencies. A notable exception is the Navigable Water Protection Act, which is administered by Transport Canada for all projects which involve the crossing of a navigable body of water.

This section describes the provincial regulatory processes, directed by Provincial Acts and Regulations, that have environmental implications. Managers involved in environmental affairs should become familiar with the implications of the Acts and Regulations listed below. Relevant sections of the legislation are available in this section and Appendix A1.

1. **Legislation with environmental implications which affect the petroleum industry include:**
   - a) Mines and Minerals Act
     AR 423/78 Exploration Regulation
   - b) Oil and Gas Conservation Act
     AR 151/71 Oil and Gas Conservation Regulations
   - c) The Pipeline Act, with the Pipeline Amendment Act
     AR 122/87 Pipeline Regulations
   - d) Oil Sands Conservation Act
   - e) Gas Resources Preservation Act
   - f) Turner Valley Unit Operations Act
   - g) Energy Resources Conservation Act
   - h) Department of Forestry, Lands and Wildlife Act
   - i) Department of Energy Act

   The latter two acts changed the structure of the original Department of Alberta Energy and Natural Resources into two Departments: Department of Forestry Lands and Wildlife and Department of Energy.

2. **Environmental Legislation which affects the industry directly:**
   - a) Clean Air Act
     AR 33/73 Clean Air Regulations
     AR 216/75 Clean Air (General) Regulations
     AR 218/75 Clean Air (Maximum Level) Regulations
   - b) Clean Water Act
     AR 35/73 Clean Water (General) Regulation
     AR 36/73 Clean Water (Industrial Plants) Regulation
   - c) Ground Water Control Act
   - d) Land Surface Conservation and Reclamation Act
     AR 125/74 Land Conservation Regulations
     AR 207/76 Regulated Oil and Gas Pipelines Surface Operation Regulations
     AR 385/79 Regulated Sand, Gravel, Clay and Marl Surface Operations Regulations
     AR 172/77 Security Deposit Ministerial Regulations
     AR 159/76 Regulated Oil Sands Surface Operation Regulations
   - e) Restricted Development Area Regulations, Pursuant to the Department of Environment Act
   - f) Water Resources Act
     AR 91/58 (amended 328/62, 187/65, 38/66) Water Resources Regulations.
   - g) Forest and Prairie Protection Act
     AR 135/72 The Forest and Prairie Protection Regulations Part I
     AR 310/72 The Forest and Prairie Protection Regulations Part II
   - h) Forest Act, 1971 Timber Management Regulations

i) Public Lands Act
   AR 423/78 Exploration Regulation
   The Mineral Surface Lease Regulations
   Regulations Governing the Issues of Licences of Occupation on Public Land
   The Public Lands Pipe Line Regulations
   The Public Lands Act Surface Material Regulations

j) Fisheries Act (Federal Government Act administered by the Fish and Wildlife Division, Alberta Forestry, Lands and Wildlife.)

3. **Environmental Regulations which may indirectly affect the industry:**
   a) Agricultural Chemicals Act
   b) Department of the Environment Act
   c) Environment Conservation Act
   d) Litter Act
   e) Planning Act
   f) Public Highways Development Act
   g) Wildlife Act
   h) Wildlife Amendment Act
   i) Migratory Bird Act
   j) Alberta Historical Resources Act
   k) Transportation of Dangerous Goods Control Act
   l) Fire Prevention Act
   m) Forests Act
   n) The Public Health Act
   o) Department of Culture and Multiculturalism Act
   p) Occupational Health and Safety Act

2.1 ADMINISTRATION OF ENVIRONMENTAL ACTS AND REGULATIONS

The primary government bodies administering Acts and Regulations related to environmental matters are:

1. Energy Resources Conservation Board (ERCB)
2. Alberta Forestry, Lands and Wildlife (AFLW)
3. Alberta Environment (AE)
4. Alberta Energy (A En)

In general, before any development project can proceed, applications must be submitted through the ERCB. Exploration permits, however, are obtained through the AFLW. Development and Reclamation Approvals and Certificates are granted by Alberta Environment, but application is still through the ERCB.

The following are the main approvals that may be required:

1. Exploration Approval - Forest Land Use Branch, AFLW
2. Approval for well drilling, production facilities, pipelines (technical and land-use aspects), ERCB
3. Development and Reclamation (D & R) Approvals and Certificates, AE
4. Surface Rights on Public Lands - Public Lands Disposition Branch, AFLW.

A wide variety of additional permits and licences may be required, depending on the particular circumstances of the intended project. Table 2.1 displays the permits required for various activities (i.e. development type and common activities). It may not be necessary to obtain all the permits shown, therefore the handbook User should ensure they have had proper contact with all regulatory agencies. Table 2.1 is to be used only as a checklist.

Table 2.1

APPROVALS, PERMITS & LICENCES POTENTIALLY REQUIRED FOR PETROLEUM DEVELOPMENTS

* See Appendix D for permit forms

AE...... Alberta Environment
ERCB... Energy Resources Conservation Board
AFLW.. Alberta Forestry Lands and Wildlife

Approval/Permit/Licence	Development Activity									
	Exploration	Drilling	Production	Pipelines	Power Lines	In Situ	Access Roads	Stream Crossings	Gravel & Borrow Pits	Camps
ERCB Approvals/Licences										
* Permit to Construct/License to Operate			●	●		●				
* Well Licence		●				●				
* Abandonment of a Well or Formation		●	●							
* Application to Report Production			●							
* Notice of Commencement/Suspension of Production			●							
* Production Spacing Unit		●	●							
* Flaring Sour Gas		●	●	●						
* Gas Processing			●							
* Plugging Back a Well		●								
* Resume Drilling Operations		●								
* Suspend Drilling Operations		●								
Surface Rights (AFLW) (Public Lands Disposition Branch)										
* IEI	●	●	●	●	●		●	●	●	
* Licence of Occupation (LOC)							●			
* Mineral Surface Lease (MSL)		●	●			●	●		●	
* Pipeline Installation Lease (PIL)				●						
* Pipeline Lease Agreement (PLA)				●						
* Miscellaneous Lease (gas plant)			●							
* Miscellaneous Permit		●	●	●						●
* Surface Materials Licence/Lease (SMC)		●	●	●				●	●	
* Easements					●					
Surface Rights Board – Right of Entry		●	●			●				
Exploration Approval/Licence (AFLW) resulting from expl. & review	●								●	
Tree Freeing Authority (AFLW)					●					
Burning Permit (AFLW)	●	●	●	●	●		●		●	●
Reclamation Certificate (AE &/or AFLW) comple. of reclamation	●	●	●	●		●	●		●	●
Development & Reclamation Approval (AE) for Regulated Pipeline				●		●			●	
Clean Air Permit/Licence (AE) (Standards & Approvals Div.)			●	●		●				●
Clean Water Permit/Licence (AE) (Standards & Approval Div.)		●	●	●		●		●	●	●
Water Resources (AE) (Water Resources Branch)										
* Licence to Divert Water		●	●	●					●	●
* Drainage Licence		●	●	●		●	●	●	●	
* Permit to Construct Works Near or Across a Stream		●	●	●			●	●	●	
* Permit for Exploration (Ground waterwells)						●			●	
* Groundwater Well Registration (for domestic use)		●	●	●						●
Pesticides Permit (AE), Herbicides Permit (AE)		●	●	●	●	●	●	●	●	●
Historical Resource Permit (Alberta Culture)		●	●	●	●	●	●		●	●
Navigation Permit (Transport Canada)				●			●	●		
Crossings (Pipelines, Road, Transmission lines)	●			●	●		●			
Road Use Agreements, Land Withdrawals	●	●	●	●		●	●			
Letters of Notification to Counties, M.D.s & I.D.s	●	●	●	●		●				
Letter of Notification – Trappers	●	●	●	●	●	●	●		●	●

Tables 2.2, 2.3 and 2.4 describe each of the approvals/permits/licences for ERCB, AFLW and AE respectively. To ensure familiarity with the major environmental government departments, the following have been included:

1. Regional offices and contacts - Appendix C
2. Copies of permits and licences relevant to the petroleum industry - Appendix D
3. Organizational charts of relevant Government Departments - Section 2
4. Application evaluation procedures - Section 2

Figures 2.1, 2.2 and 2.3 display the organizational charts for:

1. Energy Resources Conservation Board (ERCB)
2. Alberta Forestry, Lands and Wildlife and Alberta Energy (AFLW)
3. Alberta Environment (AE)

The most prominent functions of each of these departments are outlined below.

1. ENERGY RESOURCES CONSERVATION BOARD
   - a) approves, under conditions of Oil and Gas Conservation Act, applications for wells, production facilities, pipelines, and gas plants;
   - b) inspects and monitors field operations of the petroleum industry;
   - c) monitors oil and brine spills, sour gas emissions, noise guidelines and emergency response plans (ERP's).

2. ALBERTA FORESTRY, LANDS AND WILDLIFE
   - a) grants surface rights on public lands;
   - b) approves exploration programs;
   - c) reviews applications for impact on
     - (i) fish and wildlife habitat
     - (ii) timber resource
     - (iii) recreation resource
     - (iv) watershed resource
     - (v) grazing resource;
   - d) provides integrated resources policy and planning services;
   - e) provides administration and management of public lands;
   - f) coordinates all government surveying and mapping activities;
   - g) is responsible for reclamation orders and certificates on public lands.

3. ALBERTA ENVIRONMENT
   - a) approves Development and Reclamation plans and issues D & R Approvals;
   - b) issues reclamation orders and certificates for all developments on private lands;
   - c) approves stream diversions, drainage and water uses;
   - d) controls water disposal and air emissions;
   - e) issues Ministerial Consents in Restricted Development Areas (RDA's);
   - f) issues Water Resources Permits for stream crossings (pipeline and road);
   - g) issues Pesticide Application Permits;
   - h) issues Ministerial approvals for non-regulated pipelines.

TABLE 2.2
ERCB APPROVALS/PERMITS/LICENCES

Approval/Permit/Licence		Purpose and use
Gathering Systems/Batteries/Compressor Stations (Permit to Construct/Licence to Operate)	–	ERCB issues approval for construction and operation.
Gas Plants (Permit to Construct/Licence to Operate)	–	ERCB may or may not issue an approval for construction or operation (some are exempt).
Pipelines (Permit to Construct/Licence to Operate)	–	ERCB issues a permit to construct and licence to operate.
Well Licence	–	A well licence is required for all hydrocarbon related wells and for any water wells drilled to a depth beyond 150m.
Flaring of Sour Gas	–	if sour gas is to be flared at a well site or production facility (including batteries), approval must be obtained.
Notice of Commencement or Suspension of Production at a Well	–	Notice must be sent in once a well has been completed. The "Standing" well is either suspended or put in production. Notification is required again later when production is suspended.
Gas Processing	–	where gas is extracted from a well and processed in any way prior to transmission. a permit is necessary. This permit is used for compressor stations, gas collection systems and gas plants.
Application to Report Production	–	Form used to add or delete a well from a battery or group, or to classify a well as a single well battery. Form used to report production.
Production Spacing Unit	–	Approval required to determine allowable number of wells in a particular area for the purposes of production.

TABLE 2.2 (continued)

Abandonment of a Well or Formation/ Plugging Back a Well/ Resume Drilling Operations/ Suspend Drilling Operations	–	Approval is required for each of these. It provides the ERCB with a means of regulating the methods employed.

TABLE 2.3
AFLW APPROVALS/PERMITS/LICENCES

Approval/Permit/Licence	Purpose and Use
Surface Rights	
Initial Environmental Investigation (IEI)	– this is not a permit but a form which should be filled out on a voluntary basis. The IEI operates as a check list for all surface right applications. It ensures the proper information is enclosed with the application and improves the speed of approval. The form is available from Special Lands Disposition Branch. A copy of the form is included in Appendix D.
License of Occupation (LOC)	– normally issued for access roads – other dispositions may be granted to the same area. – commercial users can be charged for use of the road. – non-commercial users must be permitted to use roadways without charge. – issued by Special Lands Disposition Branch.
Mineral Surface Lease (MSL)	– grants mineral operators exclusive surface rights. – issued for oil and gas sites, battery sites, private access roads and for other purposes incidental to the recovery of minerals. – issued by Special Lands Disposition Branch.
Miscellaneous Lease	– granted for a purpose not authorized by other regulations; maximum lease term 25 years – e.g. gas plants – issued by Special Lands Disposition Branch.

TABLE 2.3(continued)

Miscellaneous Permit (MLP)	– issued for temporary use; e.g. industrial campsites, temporary mill sites, etc. – issued by Special Lands Disposition Branch
Pipeline Lease Agreement (PLA)	– issued to operators authorizing pipeline construction and incidental right-of-way installations. – issued by Special Lands Disposition Branch.
Pipeline Installation Lease (PIL)	– issued for installations incidental to pipeline operation; e.g. compressor site, meter site. – issued by Special Lands Disposition Branch.
Surface Materials Licence (SMC)	– issued for removal of sand, gravel,clay, marl, top soil, peat moss. – issued for terms of 10–25 years. – before commencing operations, an operating plan must be submitted in sketch form for approval. – issued by Special Lands Disposition Branch.
Surface Materials Lease (SML)	– issued for removing specified quantities of surface material for a maximum term of one year. – issued by Special Lands Disposition Branch.
Easement (EZE)	– issued for the purpose of running a powerline for a particular activity. – issued by Special Lands Disposition Branch.
Surface Rights Board — Right of Entry	– the SRB is only used if a proponent has been unable to obtain surface rights through normal channels. The SRB acts as an appeal board to assess refusal of surface rights. It has the power to overturn a refusal for surface rights, and if on patented land, establish the compensation fee payable to the land owner.

TABLE 2.3(continued)

Exploration Approval/ Licence	– this is the licence which is issued from the Exploration Review Branch which is required for any exploration program (e.g. seismic surveys and sand and gravel explorations.) – issued by the Exploration Review Branch.
Burning Permit	– a burning permit is required if any burning of debris, slash or any other waste items occurs in forested areas of the province between the dates of April 1 and October 31. – issued by the Forestry Division from local field ranger district offices.
Tree Freeing Authority	– this permit is issued for the freeing and clearing of trees along powerlines. – issued by the Forest Land Use Branch.
Reclamation Certificate	– once an operation is abandoned (e.g. seismic lines, well sites, production facilities or nonregulated pipelines) a reclamation certificate is required from AFLW if the operation is on crown land. – issued by the Reclamation Council.

TABLE 2.4
ALBERTA ENVIRONMENT APPROVALS/PERMITS/LICENCES

Approval/Permit/Licence	Purpose and Use
Development and Reclamation Approval	– required for the construction, operation, alteration extension or abandonment of pipelines 150 mm in diameter or greater and 16 km in length or greater. Extensions to a regulated pipeline may require an amendment to the existing D & R approval. D & R approvals are also required for sand and gravel operations greater than 5 acres in size that are on patented land. A D & R approval is issued by the Land Reclamation Division and can be considered as a major permit requirement.
Development and Reclamation Consent	– required for all Restricted Development Areas (RDA's) – see section 8.4.3
Clean Air Permit	– along with an ERCB permit to construct, a Clean Air Permit will be required for any operation which discharges pollutants to the air (e.g. gas plants or compressor stations over 750 kwh in size.)
Clean Water Permit	– along with an ERCB permit to construct, a clean water permit will be required for any operation which discharges waste water to a receiving stream (e.g. pipelines (hydro static testing), It would be noted that gas plants and compressor stations can be exempt from this permit if the proponent files a declaration of intent to conform to the Class A gas processing plant standards as outlined in the Alberta Environment "Gas Processing Plants Waste Water Management Standards".
Water Resources Permits License to Divert and Use Water	– a licence is required for long term water uses such as in plants or steam injection of wells. – for temporary water uses such as hydrostatic testing or drilling fluids, a letter of authority is used rather than a licence. Request for approval can be made by telephoning the Water Resources Regional Administrator.

TABLE 2.4 (continued)

Drainage Licence	– approval is required for drainage of land – approval is required if the proponent intends to divert a stream, or improve the channel of a watercourse or stream.
Permit to Construct Works Near or Across a Stream	– a permit is required for any construction near a stream (e.g. erosion control structures such as gabions) or construction of any structure to cross a stream (e.g. bridges, fords, tunnelling under a stream, pipeline crossings, etc.).
Permit for Exploration	– this permit is required if ground water is being explored.
Groundwater Well Registration	– all developed groundwater wells must be registered with the Ground Water Branch of Alberta Environment.
Pesticides Permits	– Green Area rights-of-way and lease permits are required to apply herbicides in the Green Area to control vegetation. – aquatic permits are required to apply pesticides within 30 horizontal metres of open bodies of water. – all permits are issued by the Pollution Control Division.
Reclamation Certificate	– as indicated in Table 2.3, reclamation certificates are required for the abandonment of any petroleum operation and D & R approval is required prior to the abandonment of a regulated operation. In many cases, when the operation is on public land, AFLW usually is responsible for the reclamation certificate. However, if the operation is a regulated surface operation on public or patented land, Alberta Environment is responsible.
Return of Security Deposits	– See section 33 LSC&R Act.

Figure 2.4 displays the overall relationship of these four departments in the approval process.

4. ALBERTA ENERGY
   - a) is responsible for the administration and management of Alberta's mineral resources;
   - b) establishes the Advisory Committee on Heavy Oil and Oil Sands Development
     - (i) to provide a liaison between the Minister and those communities affected by the development of heavy oil or oil sands resources
     - (ii) to advise the Minister on possible programs, services and facilities to those communities affected by heavy oil and oil sands development
     - (iii) to establish a continued communication between the heavy oil and oil sands industry, the residents of communities affected by the development and the various departments and agencies concerned with such development
     - (iv) to hold public hearings, receive briefs and submissions pertaining to oil sands and heavy oil development.

2.2 ENERGY RESOURCES CONSERVATION BOARD

Most of the functions of the ERCB are defined in the Oil and Gas Conservation Act, Oil Sands Conservation Act and other energy Acts. The purposes of these Acts, in part, are:

1. to control pollution in the drilling of wells and in operations for the production of bitumen, oil and gas and in other operations over which the Board has jurisdiction;
2. to ensure the observance of safe and efficient practices in the locating, spacing, drilling, equipping, completing, reworking, testing and abandonment of wells and in operations for the production of oil and gas.

The main environmental functions of the ERCB are to:

1. prescribe the information that is to be included in or is to accompany any application under the Oil and Gas Conservation Act and Regulations, including an application for a well licence;
2. prohibit the drilling of a well at any point within a prescribed distance of any boundary, roadway, road allowance, right-of-way, building of any specified type, or any specified works either public or private;
3. require notice to the Board of intention and approval of the Board before:
   - a) the suspension of normal drilling or normal producing or injection operations
   - b) the abandonment of a well
   - c) the reconditioning or recompletion of a well
   - d) the removal of a casing from a well
   - e) the resumption of drilling operations after a previous completion, suspension or abandonment of a well
   - f) the resumption of producing or injecting operations at a well after a previous suspension
   - g) the commencement of the injection of gas, air, water or other substance to an underground formation in a well that has been drilled or operated for another purpose;
4. require the erection of fences and the posting of signs or licences at a well or battery;
5. govern the removal of rigs, derricks or other equipment from a well;
6. prescribe the methods to be employed in any drilling or abandonment operations;
7. ensure that adequate measures are adopted to confine any injected fluid to the stratum to which it is injected;
8. approve the location, equipping, operation and abandonment of batteries;
9. prescribe the measures to be taken before the commencement of drilling and during drilling;

10. ensure the proper location of wells and the methods of operation to be observed during drilling to maintain:
    a) the protection of life, property and wildlife
    b) the prevention and extinguishment of fires
    c) the prevention of wells blowing out of control;
11. prescribe application forms to be used under the Oil and Gas Conservation Regulations;
12. inspect operating sites and enforce the standards, specifications and conditions of approval. (See ERCB ENERFAX Factsheet No. 3 - Inspection and Enforcement in Energy Development in Alberta, available from the ERCB).

Table 2.2 outlines the permits and the purpose of each permit under the jurisdiction of the ERCB.

Regulations related more directly to environmental protection are made with the approval of the Minister of the Environment. These include:

1. restricting drilling and producing operations in water covered areas, and prescribing any special measures to be taken in such operations;
2. prescribing the location of wells and the methods of operation to be observed during drilling and in the subsequent management and conduct of any well for the prevention of pollution;
3. prescribing the measures to be taken to control pollution above, at or below the surface in the drilling of wells and in operations for the production of oil, gas and crude bitumen and in other operations over which the Board has jurisdiction.

The Board prescribes conditions under which it grants approvals, permits or licences, but by law they must meet or exceed the requirements of the Minister of Environment.

ERCB guidelines exist in the following areas:

1. site considerations for well sites, pipeline routes, battery and compressor stations, and gas processing plants. These site considerations include description of legal surveys, description of surface topography including significant water bodies, drainage, surface improvements, wells, coal mines and water wells in the vicinity of the proposed development;
2. contingencies and emergency response for potential oil and saltwater spills and sour gas related problems;
3. air pollution from testing, venting, flaring and equipment maintenance;
4. blowout prevention procedures;
5. disposal of produced water;
6. containment of liquid wastes such as drilling fluids and production installations;
7. noise control for drilling, producing, processing and pipeline operations;
8. protection of archaeological, paleontological and historical resources.

The handbook user should also refer to an ERCB document entitled 'What is the Energy Resources Conservation Board' - ENERFAX Factsheet No. 1, available from the ERCB.

2.2.1 ERCB DEPARTMENTS

Four Departments of the ERCB have environmentally related responsibilities:

1. Development Department
2. Environment Protection Department
3. Gas Department
4. Pipeline Department

The function of each department is as follows:

2.2.1.1 Development Department

The Development Department consists of the drilling and production section, and the field operations section.

The functions of the drilling and production section are to:

1. process applications;
2. issue permits to drill, suspend, rework, plug back or abandon wells;
3. issue permits to construct or modify gas and oil production batteries;
4. give approval for water and waste disposal schemes;
5. check volumes of waste disposed in pits and wells and ensure that these volumes are within the prescribed limits.

The functions of the field operations section are to:

1. advise operators of the requirements of various acts, regulations, directives and approvals;
2. inspect equipment and witness operations at drilling rigs, service rigs, producing wells, batteries, gas plants, injection wells, disposal systems and pipelines and, when necessary, to require that equipment or operations be modified to meet Board requirements;
3. inspect oil and gas field operations which might cause contamination of air, soil or water, and to take any necessary action to prevent or control pollution at acceptable levels; and to investigate and take action when pollution complaints are received.

2.2.1.2 Environment Protection Department

The functions of the environment protection department are to:

1. provide an active liaison with Alberta Environment respecting new integrated roles;
2. provide advice and assistance to the Board and Board Departments respecting:
    a) environmental issues related to major energy resource applications considered by the Board
    b) other environmental issues or problems coming before the Board or its departments during the course of day-to-day business;
3. consult with and advise other government departments (in particular, Alberta Environment) on environmental issues and on energy resource matters from the ERCB's perspective;
4. resolve complaints and requests by the general public and the industry.

2.2.1.3 Gas Department

The functions of the gas department are to:

1. assess the suitability of proposed gas processing facilities from a conservation and environmental perspective;
2. review the performance of existing facilities.

2.2.1.4 Pipeline Department

The functions of the pipeline department are to:

1. evaluate applications for permits to construct pipelines with regard to technical adequacy, environmental legislation, pollution control and the protection of rights of landowners;
2. process licence applications for the operation of pipelines;
3. issue licences after proper construction and testing requirements have been met.

2.3 ALBERTA FORESTRY, LANDS AND WILDLIFE

Alberta Forestry, Lands and Wildlife has four divisions/branches that have environmentally related functions that may apply to activities of the oil and gas industry:

1. Public Lands Disposition Branch, Public Lands Division
2. Land Management and Development Branch, Public Lands Division
3. Forest Land Use Branch, Alberta Forest Service
4. Habitat Branch, Fish and Wildlife Division

The permits issued by the above divisions are outlined in Table 2.3.

The functions and responsibilities of each division are discussed in the following pages.

2.3.1 DEPARTMENTAL BRANCHES

2.3.1.1 Public Lands Disposition Branch

Under the Public Land Act, the Public Lands Disposition Branch is responsible for the authorization and regulation of all operations (e.g. Surface Rights) on Crown land under the administration and control of Alberta Forestry, Lands and Wildlife.

While the vast majority of all Crown land in the Province falls under the jurisdiction of The Public Lands Act, there are several significant areas which do not: The Special Areas and Metis Colonies administered by Alberta Municipal Affairs, and Provincial Parks administered by Alberta Recreation and Parks.

Therefore, in order to enter upon, occupy, or utilize any Crown lands, authority must be obtained from the appropriate Department, and in most instances this will be Alberta Forestry, Lands and Wildlife, through the Public Land Division.

Table 2.3 provides a list of types of common Crown land dispositions that have been defined by the government, and a brief explanation of the various terms. Copies of application forms, which cover most types of land dispositions that might be required by the oil and gas industry, are attached in Appendix D.

In addition, AFLW has produced an Initial Environmental Investigation (IEI) form which will aid the proponent when requiring a public land disposition. The form provides the proponent with a checklist of environmental information required. The IEI form is not a requirement and is simply on a voluntary basis. There are three types of IEI's available: geophysical, well site and linear. Samples of each are included in Appendix D - Permits.

Appendix C lists the various District Supervisors responsible for these regions. It should be noted that these District Supervisors are responsible for administering the White Areas of the province whereas the forest or land-use officers of the Forest Land Use Branch of AFLW (see below) are responsible for the Green Area.

When the IEI application is submitted to AFLW, it is sent to Surface File Records where it is Kardexed and placed in a file folder.

After these actions have been completed, the application is forwarded to the Application and Evaluation Section for processing. An application should complete the above process in one to two days.

When the application is received in the Special Land Disposition Section, it is first evaluated for major factors such as legal conflicts and planning implications, and partially reviewed for environmental constraints. (The latter is done by reference to data supplied by other agencies. Detail will be provided through the referral process to the land management groups.) The land standing is then reviewed to determine if any consents are required and, if so, whether they must be received prior to an Authority being granted or if a Condition of Approval can be granted.

The second check carried out by the Section is to determine if any government management agency has an interest in the area of an application.

These concerns are usually indicated by a notation or reservation entered in AFLW's records by a concerned Agency who may have plans for a particular area. For example, a DRS 341 indicates a Disposition Reservation for a recreation campground in favour of the Alberta Forest Service, and necessitates referral to and approval by the Recreational Section of the Forest Land Use Branch prior to a Letter of Authority being issued.

A second method by which management agencies indicate planning concerns is by the designation of study areas which have been defined for the province. Some examples are the Lakeland Study Area, Cooking Lake Moraine Study Area and the Peerless-Graham Lake Study Area.

A third method of indicating planning concerns is establishment of "Special Areas", such as Kananaskis Country, with perhaps the best example being the Eastern Slopes with its detailed zoning, specifying compatible and non-compatible land usages.

The impact of these planning concerns is to require either the adoption of special procedures in processing an application, or a more extensive referral of the application to various committees, agencies and/or individuals for evaluation and approval.

The final check carried out by the Special Lands Disposition Section is to identify those agencies to which the application must be referred for review of potential environmental constraints affecting the proposal. All applications are directed to either the Lands Division or the Alberta Forest Service, depending on both the location and purpose of the operation.

Governmental procedures involved in the evaluation of public land disposition applications (Surface Rights) have been excerpted below.

The Department utilizes a Single Window concept in processing Surface Rights Applications. The Special Lands Disposition Section accepts the proposal, refers it to appropriate Government Agencies, and provides a single coordinated reply which could be a letter of authority to proceed as submittted, with conditions, or no approval to proceed.

Applications for public land dispositions are initially received by the Surface Rights Plotting Unit (SRPU) who check to ensure that the legal description is consistent with the plan submitted, that the application does not contain lands already under disposition, and in the case of linear developments (such as pipelines, power lines and roads) that they originate and terminate in an existing disposition or application. The application is then assigned a number and plotted on Mylar plans noting conflicts with other industrial dispositions, if necessary.

After this has been completed, the application is directed to Surface Township Records where the application is recorded against each quarter section affected in the official records of the Department, and a land standing for all lands is prepared.

In addition, each application is referenced to criteria submitted by other agencies to determine whether or not they should have input into its approval. The agencies which are commonly involved in the consideration of Industrial Applications are: The Fisheries Habitat Protection Section, The Wildlife Habitat Protection Section, The Provincial Parks Division, Alberta Environment, Alberta Transportation and Utilities and The Irrigation Division of Alberta Agriculture.

Depending on the proposed land usage and the area in which it is located, however, applications may be referred to some of the following:

1. The Minerals Disposition Division of Alberta Energy
2. The Realty and Accommodation Division of Alberta Public Works
3. Alberta Culture and Historic Resources
4. The Alberta Housing Corporation
5. Alberta Municipal Affairs

6. Regional Planning Commissions
7. Local Levels of Government
8. The Civil Aviation and Communication Branches of Transport Canada
9. The Department of National Defence
10. The Lakeland Steering Committee
11. The Natural Areas Committee, the Development and Reclamation Review Committee of Alberta Environment, The Exploration Review Committee, etc.

The three checks conducted by the Special Lands Disposition Section will determine to whom the application must be referred for approval, the legal conflicts involved and the consents required. At this point, the details of the application and the referral agencies involved are recorded in the Section Logs. Copies of the application are prepared and delivered by Special Courier to the designated agencies (such as Forestry) and the applicant is advised of required consents. The checking and referral of the application should be completed by the SRPU within one day of receipt. After this checking and referral, the application can then proceed for review by the management agencies.

Review by the management agencies, such as the Forest Land Use Branch, AFS, requires approximately 8 working days. This turn-around time can be shortened considerably if the proponent has been in touch with the field staff of the referred agencies prior to submitting their application to the AFLW and has made them aware of the proposal.

2.3.1.2 The Forest Land Use Branch of Alberta Forest Service

The Forest Land Use Branch, supported by Forest Service field staff, is responsible for and monitors all industrial and commercial activity in the Green Area. All applications for exploration and development programs in the Green Area must be referred to and reviewed by the Forest Land Use Branch.

For administrative purposes, the Green Area is broken down into ten Forests, each of which is divided into 3 to 7 districts. At each Forest Headquarters, the Land Use Officer (LUO) is the initial project planning contact, and is in charge of coordinating the processing of applications. The Chief Ranger or Forest Officer in each District reviews each application and develops conditions of approval, then forwards these through the LUO of his Forest to the appropriate Coordinator in Edmonton.

Large areas in the Green Area have been set aside by the government to enable certain large companies in the Forest Industry to harvest the forest resource in a well-managed and productive manner. These areas are referred to as Forest Management Agreement (FMA) Areas. Under Section 14 of The Forests Act, 1971, these designated companies are entitled to compensation for all timber damaged within their area, and mineral operators are advised to maintain close contact with these companies. Address lists of the corresponding Ranger District and FMA offices can be found in Appendix C.

The Forest Land Use Branch acts as the overall coordination point for land use planning and approval of all Petroleum and Natural Gas projects (all stages) for the entirety of the Green Area. The total responsibility for implementation of the Exploration Regulations (AR 423/78) throughout the province was transferred to the Branch in October 1984. Under these regulations, exploration programs must receive approval before projects can be undertaken.

This coordination of responsibility involves joint consultation with other management agencies at the field level, such as Fish and Wildlife, which have specific concerns in the Green Area. Areas of concern are normally identified on departmentally approved referral base maps. This management responsibility function makes the Forest Service the one window for industry at field and head office level. In conjunction with exploration programs, the following should be noted:

1. **Definitions:**
   a) Exploration Approval is the approval of the preliminary plan for exploration;
   b) Exploration Licence is the licence to conduct exploration;
   c) Exploration Permit is the permit to operate exploration equipment.
2. **Consents Needed for Exploration Operations:**
   a) On private land: consent of owner;

b) On Crown land: consent of appropriate government department;

c) On occupied public land: consent of holder or disposition to which the lands are subject.

Copies of government-approved forms for exploration permits to be drawn up between private landowners and exploration companies are attached in Appendix D. Section 11(1) of the Regulation outlines in detail the application procedures required to apply for an exploration approval. The application must include a preliminary plan of the project, the name, address and licence numbers of the licensee who will conduct the exploration, and name, address and permit number of the permittee who will operate the exploration equipment.

Every application for an exploration approval will be subjected to the referral system as described in Section 3.0. Upon completion of the exploration program, a final plan for the approved exploration program must be submitted. For more details, the Exploration Regulations should be consulted.

2.3.1.3 Land Management and Development Branch

This Branch serves the same function in the White Area of the province as the Forest Land Use Branch does in the Green Area. For administrative purposes, the province is divided into regions, subregions and districts.

2.3.1.4 Fish and Wildlife Division

The Fish and Wildlife Division is responsible for the management of the fisheries and wildlife resources in Alberta. As part of the habitat management effort, the Division is currently developing both fisheries and wildlife habitat guidelines, which are applicable to industrial operations on public lands.

During the course of governmental approval procedures, many industrial applications will be referred to the Fish and Wildlife Division for review, based on specific referral criteria identified on departmental base maps (key area maps). Applicants are advised to contact the appropriate Fish and Wildlife Habitat field staff of their area as early as possible in order to obtain any information that can be useful in completing their application.

2.4 ALBERTA ENERGY

Alberta Energy consists of the energy resources and the finance and administration sections. The functions of these sections are as follows:

1. Energy Resources:
   a) Policy Analysis and Planning
   b) Mineral Resources
   c) Scientific and Engineering Services
2. Finance and Administration:
   a) Mineral Resources
   b) Finance and General Services
   c) Automated Information Systems
   d) Personnel Services
   e) Internal Audit

2.5 ALBERTA ENVIRONMENT

A recent restructuring of Alberta Environment has created the following three service groups:

1. Finance, Administration, Policy and Planning Services
2. Environmental Protection Services
3. Water Resources Management Services

As illustrated in Figure 2.3, each service group is subdivided into a number of divisions. Divisions with functions that could affect the Petroleum Industry are as follows:

1. Finance, Administration, Policy and Planning Services
    - i) Land Reclamation Division
2. Environmental Protection Services
    - i) Pollution Control Division
    - ii) Standards and Approvals Division
    - iii) Environmental Assessment Division
    - iv) Waste and Chemicals Division
3. Water Resources Management Services
    - i) Water Resources Administration Division

The permits issued under the jurisdiction of Alberta Environment are outlined in Table 2.4.

2.5.1 DEPARTMENTAL SERVICES

The function and responsibilities of each Service are briefly described below.

2.5.1.1 Finance, Administration, Policy and Planning Services

1. Land Reclamation Division

The Land Reclamation Division is the principal government agency responsible for the administration of the Land Surface Conservation and Reclamation (LSCR) Act and Regulation made thereunder (see Appendix A1).

Any of the following land surface disturbing activities may be affected by this Act:

a) the drilling, operation or abandonment of a well;
b) construction, operation or abandonment of a pipeline, battery, transmission line or telecommunication line;
c) opening up, operation or abandonment of a mine or quarry;
d) opening up, operation or abandonment of a pit or of a waste disposal site or landfill site;
e) exploration operations that result or will result in surface disturbance;
f) construction, operation or abandonment of a road, aircraft landing strip, mineral processing plant, railway;
g) construction, operation or abandonment of a site for subsurface disposal of solid or liquid waste;
h) conduct of examinations and surveys on land made in connection with water or the conduct of exploration in respect of surface and subsurface water;
i) construction of any works for the impoundment, conveyance or diversion of water.

The Division has three principal functions:

a) review of applications for Development and Reclamation (D & R) Approval;
b) monitoring of surface disturbances for compliance with the minimum reclamation requirements pursuant to the LSC&R Act;
c) issuing reclamation Orders and Certificates;

D & R Approval is required only for "Regulated Surface Operations".

The activities that will require D & R approval within the scope of this handbook are:

a) oil and gas pipeline operations where the pipeline is both 150 mm or more in diameter and 16 km long or more in length.
b) Alterations or extensions to regulated pipelines where the alteration or extension is either 16 km or more in length or located in a named river valley, or located within 30 metres of the upper breaks of a named river valley.
c) sand and gravel operations (5 acres or more in size).
d) is situ heavy oil developments.

The D & R approval process is shown in Figure 2.5. If D & R approval is required, the proponent must submit comprehensive plans describing methods of development and a program for conservation and reclamation. Further details regarding D & R approvals can be found in Section 6.1 (Pipeline Application Procedures) and Section 8.4 (Reclamation and Conservation). In general, a Reclamation Certificate must be obtained before any operation can be abandoned. Reclamation Orders can be issued if reclamation is found unsatisfactory. In a D & R approval, reclamation is a very important component. Reclamation is not only required for regulated operations but for all activities.

D & R approval for Abandonment and Reclamation Certificates are issued under the Land Surface Conservation and Reclamation Act (LSC&R) and Regulations.

The Authority to administer the reclamation enforcement aspects of the LSC&R Act has been divided between AFLW and Alberta Environment. In broad terms, the responsibilities are divided as follows:

a) Alberta Environment: designated regulated operations (e.g. pipelines) on private lands and on public lands in Green and White Areas.
b) Public Lands Division, AFLW: public lands in White Areas.
c) Alberta Forest Service, AFLW: public lands in Green Areas.

2.5.1.2 Environmental Protection Services

The Environmental Protection Services of Alberta Environment includes the Environmental Assessment Division, the Standards and Approvals Division, the Pollution Control Division, and the Waste and Chemicals Division.

The Environmental Assessment Division administers Alberta's Environmental Impact Assessment process. The Standards and Approvals and Pollution Control Divisions deal with the administration of discharges of wastes into the air, into water, and onto land, as defined under the Clean Air and Clean Waters Act and regulations thereunder (see Appendix A1 and Figure 2.8).

1. Standards and Approvals Division

The Division is responsible for the review of all industrial and municipal applications for Permits to Construct and Licences to Operate new and/or existing facilities in accordance with the Clean Air Act, the Clean Water Act and the Hazardous Chemicals Act and their corresponding regulations. Permits are issued for new facilities and for alterations to existing operations once the division is satisfied with the proposed environmental protection program. Licences specify operating, monitoring and reporting requirements which must be followed by the operating facility. The Division also establishes ambient air, surface water, drinking water and plant decommissioning guidelines and standards and hazardous wastes control requirements. The division prepares amendments to the Acts and Regulations as required.

In some cases (e.g. drilling operations), only ERCB approval will be required. As mentioned before, the ERCB has developed, in cooperation with Alberta Environment, clean water and clean air objectives for such operations. Only for large-scale or particularly controversial applications will the proponent have to deal with the Standards and Approvals Division directly.

Once a licence has been granted, it is the function of the Standards and Approvals Division to monitor the operations. Monthly or yearly monitoring reports, as stipulated in the licence, must be sent to the Director of this Division. The reports are checked for compliance with existing licences. Any uncontrolled releases of pollutants to the environment must be reported to the Director of Pollution Control within 24 hours and confirmed in writing within 72 hours.

Another function of the Pollution Control Division is the control of biocides. In general, the use of pesticides is prohibited unless a permit from the Pesticide Chemicals Branch has been obtained. An example of such a permit can be found in Appendix D.

2. Pollution Control Division

The main functions of the Pollution Control Division have just been changed in 1988. Formerly one of its main funtions was to monitor an operation once a licence to operate was issued. The monitoring role is now part of the Standards and Approvals Division.

The Pollution Control Division is now responsible for

(a) investigations
(b) enforcement.

Any uncontrolled releases to the environment must be reported to the Director of Pollution Control within 24 hours and confirmed in writing within 72 hours. If the public or any of the other Divisions suspect an infraction, they are also to report it to the Pollution Control Division. All suspected infractions will be investigated. If a violation is substantiated, an order and enforcement of the order will be necessary. The investigation and enforcement activities will be undertaken within the Pollution Control Division.

3. Environmental Assessment Division

This Division administers Alberta's Environmental Impact Assessment process. The Minister of the Environment may require a proponent to prepare an Environmental Impact Assessment (EIA) report pursuant to Section 8 of The Land Surface Conservation and Reclamation Act.

EIA's are required on most major resource development projects in Alberta. It is the proponent's responsibility to seek clarification from the Department regarding the need for an EIA for a particular project. Failure to do so at the earliest opportunity may result in unnecessary delays. Alberta Environment has issued EIA guidelines (1985) to assist proponents of proposed developments who have been required by the Minister to prepare and submit an EIA.

If an EIA is not warranted, the proponent is still responsible for submitting environmental information in support of applications for permits pursuants to specific environmental legislation.

The Environmental Assessment Division is also responsible for lands within the Restricted Development Areas (RDA's) (see Figure 2.13). A Ministerial Consent is required for virtually any surface disturbing activity or proposed development in these areas. It should be noted that the RDA's, designated pursuant to Section 16 of The Department of the Environment Act, serve two distinct functions: (1) protecting the Transportation and Utility Corridor lands around Edmonton and Calgary, and (2) protecting selected environmentally sensitive areas (e.g. certain river valleys and floodplains areas). Development is not impossible in the Transporation and Utility Corridors, but must be compatible with Government's long-range plans for the Corridor facilities. In the environmentally sensitive areas some development may also be allowed, but likely will be subject to stringent mitigative conditions for environmental protection. The user should contact the Land Use Branch of the Division for more information (see Appendix C).

2.5.1.3 Water Resources Management Services

1. Water Resources Administration Division

Responsibilities of the Water Resources Management Division are derived from the Water Resources Act and Regulations (AR 91/58) and Dam and Canal Safety Regulations (AR 351/78).

Some of the activities of the petroleum industry that fall under the jurisdiction of this Division are as follows:

a) water intake from surface and groundwater bodies
b) drainage operations
c) removal of gravel from streams or lakes
d) stream crossings in streams with defined bed and banks
e) any development activities near water bodies
f) activities in irrigation districts in southern Alberta.

Copies of application forms for licences to Divert Water, Drainage licences, Permits to remove Sand and/or Gravel from Stream Beds, Permits for Stream Crossings and Exploration for Groundwater Supply can be found in Appendix D - Permits. Application procedures for access roads and stream crossings are shown in figures 2.6 and 2.7 respectively.

2.6 REGULATORY PROCEDURES FOR INTERPROVINCIAL, FEDERAL AND TRANSBOUNDARY ACTIVITIES

If a proponent has an activity which crosses a provincial boundary, the regulatory procedures for the province in which the activity is occurring must generally be recognized. For information on Saskatchewan Legislation and Permits, refer to a document entitled "The Regulatory Manual for the Saskatchewan Heavy Oil Project." The document must be obtained from one of the participants: Petro Canada, Gulf Canada and Sask Oil.

Occasionally, the proponent may become involved in Federal lands and in this case certain Federal Acts and regulations may have to be followed. Examples of these type of Federal lands are Indian Reserves, military ranges, P.F.R.A. community pastures, bird sanctuaries, etc.

Some of the Federal government regulatory procedures are as follows:

1. **Environment Canada**

   a) The Federal Environmental Assessment and Review Process (EARP)

   The EARP process may be required by the Federal Government if the proponent is involved with production facilities on Federal lands. Generally, though, this requirement is not invoked for the type of development discussed within this handbook. The type of production facility that would require an Environmental Assessment and Review consists of the very final stages of production and with serious potential impacts.

   The EARP process requires the establishment of an Environmental Assessment Panel. The panel reviews the identified environmental impacts of the project and makes a decision as to whether the project should proceed or not.

   b) The Migratory Birds Convention Act, RS 1970, c.M-12

   This Act is administered by the Canadian Wildlife Service, Environment Canada and provides the necessary legislation to protect migratory birds (e.g. ducks, Canada geese, etc.) which, in their normal environment, traverse provincial boundaries throughout the United States and Canada. Under this Act, the proponent may be charged with polluting an area frequented by migratory birds. It also protects nesting areas and the depletion of the various species. In addition, the Act stipulates conditions for hunting migratory birds.

   c) The Wildlife Act

   The Federal Wildlife Act is administered by the Canadian Wildlife Service, Environment Canada. The purpose of this Act is to protect, conserve and interpret wildlife in Canada. This Act works in cooperation with any provincial legislation but it does have the legislation to limit access to any Federal wildlife or bird sanctuaries in any particular area.

2. **Indian Affairs and Northern Development Canada**

a) The Indian Act - Indian Oil and Gas Regulations, RS, c.149, s.1

The Act and Regulations are administered by the Indian Minerals Office (West) of Indian Affairs and Northern Development. The Act provides legislation regarding the exploration and production of oil or gas resources on Indian Reserves.

The Indian Minerals Office can dispose of oil and gas rights on an Indian Reserve by issuing an oil and gas permit, an oil and gas lease, a gas licence or a gas lease. The difference between these permits is defined in the Regulations. The Regulations also define the surface lease requirements, including surveying procedures. In addition, the Regulations discuss production drilling with wells on Indian Reserves and wells immediately adjacent to Indian Reserves.

With regards to environmental policy on Indian Reserves, the proponent should satisfy the laws, regulations and policies of the Province regarding the environment. Although Federal lands are administered by Environment Canada, the standards of Alberta Environment are usually the requirements that must be satisfied.

3. **National Energy Board**

a) National Energy Board Rules of Practice and Procedures, CRC, Vol. XI, c.1057

This Act provides information on requirements for a proponent if filing for a Certificate or Order that may be necessary for a gas and oil pipeline crossing provincial boundaries and/or Federal lands. It should be noted that this Act will only be utilized if the pipeline crosses provincial borders or Federal properties and/or is considered as a major gas or oil transmission line.

The Act outlines the need for the following:

(i) a description of alternatives and the reason for selection

(ii) a description of the project

(iii) existing environmental conditions:
  - physical
  - ecological
  - present land uses

(iv) impacts on the environment:
  - physical
  - ecological
  - social
  - archaeological

(v) procedures for initiating protective measures against defined environmental hazards

(vi) assessment of the residual impacts

(vii) identification of statutory requirements and the standards of other regulatory agencies.

The Act also provides information on the proponent's need to identify safety precautions and design criteria. To establish design criteria, the Act stipulates that the proponent should identify ground conditions, river and lake bottom conditions, kinds and approximate numbers of fish and wildlife species which will be crossed by the pipeline, and the quantity and quality of borrow pit material.

The Act also stipulates that the proponent identify conservation procedures and pollution prevention and control.

4. **Regional and Economic Expansion Canada**

   a) P.F.R.A. Pasture Lands Surface Rights Policy

   Since a number of P.F.R.A. pasture lands are scattered throughout western Canada, the policy for entering these properties should be recognized although there has been no particular problem in gaining access to the properties in the past for oil and gas development. Permission for access must be obtained from the Land Administration, P.F.R.A., Agriculture Canada, in the province where the property is located. A Surface Lease or Pipeline Easement will be prepared at that office. As with Indian Reserves and other Federal properties, the proponent must follow the laws, policies and regulations of the province regarding the environment.

5. **Transport Canada**

   a) The Navigable Waters Act, RS, c.193, s.1

   The Navigable Waters Protection Act is a Federal statute designed to protect the public's right of navigation in navigable waters by prohibiting the placement of any structure in, over, under, through or across a navigable water without the Approval of the Minister of Transport Canada. The Act is administered by the Canadian Coastguard Organization of Transport Canada in Vancouver, British Columbia. It should be noted that an Approval granted by the Minister is only an authorization to interfere with the public right of navigation to the extent of the work.

   For the petroleum industry, the Act may be applicable for any pipelines, roads, etc., which cross navigable waters. Navigable waters include any body of water capable, in its natural state, of being navigated by floating vessels of any description for the purpose of transportation, recreation or commerce. It also includes a canal and any other body of water created or altered for public use, as a result of the construction of any work, as well as any waterway where the public right of navigation exists by dedication of the waterway for public purposes, or by the public having acquired the right to navigate through long use.

   NOTE: The preceding definition is used for administrative purposes only and is not to be construed as a legal definition of navigability. Navigability is a matter of fact and not of law. The authority to determine navigability of waterways rests with the Minister of Transport Canada.

   b) Transport Canada Policies for Airports

   Regulations regarding proximity of drilling, etc., to airports are based on the Aerodrome Standards. If the airport is a Federal airport and oil or gas activity takes place on airport property, then the proponent must obtain approval from Transport Canada. If the airports are provincial or community-owned, then the proponent must deal with the provincial or community authority. It is likely that the community or provincial authority will contact Transport Canada for the Aerodrome Standards.

   If the development is outside of the airport, but may impact the airport, there are zoning restrictions the airport must invoke.

   If the airport is Federal, then the zoning restrictions are available through Transport Canada. The restrictions for zoning at community or provincial airports are the responsibility of the airport authority. In some cases, the airport authority has its own zoning restrictions, whereas in most cases it will be the municipality's own zoning requirements or provincial requirements.

   Due to the site-specific nature of these Regulations, the proponent should contact Transport Canada for any activity close to an airport.

2.7 GENERAL AGREEMENTS, APPROVALS OR PERMITS

The proponent must also recognize that there are general agreements and approvals that must be obtained from private landowners, other lease holders and municipalities. Table 2.1 has made reference to these latter two types of agreements. Explanations of the general agreements are as follows:

1. road use agreements - (eg. use of a road constructed by another lease holder such as a forestry company)
2. notification of road use to a municipality
3. crossing another company's pipeline or road
4. permit to cross a provincial road (i.e. Alberta Transportation and Utilities) or a municipal road (i.e. municipality)
5. notification to registered trappers. It is essential that this notification be sent well in advance (minimum 5 days) of the actual activity occuring to ensure the trapper is notified
6. Navigational Water Permit - issued by the Federal Government
7. Historical Resources Permit to protect archaeological and historical sites - issued by Alberta Culture.

2.8 MAPS OF JURISDICTIONS

The following district maps of key government agencies are provided at the end of Section 2.0:

1. ERCB Area Offices (Figure 2.9)
2. AFLW Ranger District Map (Figure 2.10)
3. Municipalities (Figure 2.11)
4. AFLW Regions (Figure 2.12)
5. Restricted Development Areas (RDA's) (Figure 2.13)
6. Land Conservation and Reclamation Council Districts (Figure 2.14)
7. Water Resouces Administration Division Regional Boundaries (Figure 2.15)

2.9 APPLICATION PROCEDURES AND REFERRAL SYSTEMS

Refer to the "Permits, Approvals and Application Procedures" section for each specific development (Sections 3 to 7).

The information available in Sections 3 to 7 will provide key starting points in the application procedure.

2.10 PUBLIC INVOLVEMENT

Any activity which is to be carried out within boundaries or jurisdiction of counties, municipal districts and improvement districts could be delayed by contravention of municipal regional by-laws. Many misunderstandings and delays can be avoided simply by proper communication with representatives of the appropriate municipality or regional planning commission. (See ERCB ID 81-4 regarding municipal administrator's awareness of petroleum developments. Also see ID 87-2 for minimum spacing requirements from residential areas for sour gas wells.)

In particular, it should be noted that there are:

1. **zoning by-laws** that restrict the location and type of development
2. **land-use plans** which are prepared by the appropriate regional planning commission
3. **regulations** governing road crossing by pipelines
4. **road load restrictions** (overload permits are required for moving heavy equipment and pipes)
5. **equipment licences** which restrict the type of equipment which may be used in particular areas to control problems such as noise or air pollution.

The handbook user should refer to an ERCB document entitled " Having Your Say at an ERCB Public Hearing ". This document provides useful information for an intervener and is very basic in its approach. It provides a good overview of where the public can obtain information and what happens at a hearing.

2.10.1 PUBLIC HEARINGS

(References: ERCB Public Hearing Process - G-16 and 'Having Your Say at an ERCB Public Hearing' - ENERFAX Factsheet No.2)

The petroleum industry recognizes the right of the public to intervene in certain projects which they feel may affect them.

A company proposing to locate a facility in a community must become aware of the concerns of the residents and acquaint them with the project's plans. Contact should be made with key people in the community such as the Town Administrator, Chairman of the Chamber of Commerce and local residents who may be affected. The ERCB is of the view that, in many cases, it would be beneficial to all parties to hold public information meetings before an application is made to the Board for approval of an energy project. The ERCB would send a representative to the meeting to describe the requirements and procedures applicable to the ERCB's consideration of the development and the standards which would have to be met. The ERCB expects that other Government departments and agencies having major responsibilities respecting energy resource projects would also be prepared to have appropriate representatives attend the meetings. In some instances, private discussions with representatives of the area may be desirable in place of, or in addition to, a public meeting. The public meeting or private discussions should encompass the company's plans and the possible impact on the local residents.

The ERCB holds public hearings frequently on all petroleum-related activities for which they are responsible. In this handbook these activities are found in to Sections 4 to 7: drilling, production facilities, pipelines and in situ heavy oil projects.

2.10.1.1 Purposes of Hearings

The hearing process is utilized not only to satisfy a legal requirement but also to fulfill several other purposes. Not the least of these other purposes is the objective of enhancing the ERCB's information and understanding as to the matters upon which it must render a decision. In that regard, the ERCB frequently invites public participation in hearings where the only issues at stake are matters of policy, which the ERCB may wish to use to guide its future decisions. As well, the ERCB or the Government may on occasion identify circumstances which appear to require further explanation or clarification. On such occasions the ERCB may conduct a hearing or inquiry to investigate those unexplained circumstances.

Most ERCB hearings are conducted by a panel of three or more ERCB members appointed for that purpose by the ERCB Chairman. The senior member of the panel normally assumes the duty of panel chairman for purposes of the hearing.

In circumstances where the ERCB has previously considered several similar types of applications and the principles leading to a decision have become reasonably well established, the ERCB may choose to appoint examiners to conduct a future similar type of hearing. The use of examiners thus assists the ERCB in the expeditious handling of matters before it.

2.10.1.2 Pre-Hearing Consideration

When a public hearing is scheduled, it is usually preceded by a substantial amount of consideration and effort on behalf of the ERCB and its staff. Where a hearing arises as a result of an application, the application is usually first considered in detail by the ERCB's technical staff. Applications are required to be made in accordance with criteria established either by a directive of the ERCB or established by a specific Act or regulation. On the basis of such criteria, the ERCB staff undertake a critical evaluation of the application, and may correspond with the applicant to ensure that all criteria have been adequately addressed by the applicant. When the application is judged by the ERCB staff to reasonably satisfy the minimum criteria, the ERCB is so advised and it is then able to review the considerations addressed by its staff and make the decision whether to consider the matter further at a hearing.

Once a decision has been made to hold a hearing, a number of subsequent determinations must also be made, such as the location (e.g. generally near the site of proposed development) and the size and capability of the facility where the hearing will be held.

In issuing a notice of hearing, the usual policy followed by the ERCB is to provide a mailed notice to each known person who, in the ERCB's opinion, may be directly and adversely affected by its decicion. For purposes of general information, and to ensure notice is available to persons who may be indirectly affected by the application, the ERCB requires that notice also be published in those newspapers having a general circulation in the area of the application.

2.10.1.3 Coordination with Government Departments

During the planning and evaluation phase of its consideration of an application but prior to a hearing, the ERCB endeavours to coordinate its activities with various Alberta Government departments that have similar jurisdictional interests to those of ERCB. This is particularly true in the case of environmental matters, as the ERCB shares with Alberta Environment responsibilities for the protection and preservation of the environment. Coordinating efforts also occur with other government departments. Where such a cooperative effort takes place, it sometimes becomes difficult for interveners to sort out the separate responsibilities of the ERCB and the various government departments.

2.10.1.4 The Hearing Process

At each hearing, the ERCB endeavours to take into account the uniqueness of the matters before it and to maintain a high degree of flexibility as to the procedure it will follow. Generally, however, the procedure at each hearing is regulated by three general principles. First, each participant is treated fairly, having a reasonable opportunity to ask questions and to make representations and explanations. Second, there is an effort to ensure that the hearing proceeds in a reasonably logical and orderly fashion, such that the ERCB and the participants alike will not be lost in a maze of discussion and paper. Finally, provision is made for general rules of conduct, to ensure that the hearing is conducted in an expeditious fashion and to ensure that no person will be precluded from expressing any reasonable view, or will have an unfair advantage in making any representation.

The procedure the ERCB follows at its hearings is usually much less complex than may at first appear. The principal element to note is that the ERCB's procedure requires written submissions to be filed with it prior to the hearing.

An applicant is expected to file with the ERCB a complete application, which addresses all of the matters the applicant will expect the Board to take into consideration at the hearing to arrive at a decision on the matter.

2.10.1.5 Submissions by Interveners

When the ERCB publishes a notice for a hearing, it invites persons who may be concerned with or who may be adversely affected by the application to make a written submission, which is termed an intervention. To assist interveners, the ERCB requires applicants, on request, to provide to each interested person a copy of the application. Applications are also available for inspection by the public at the ERCB's offices. This availability of information prior to a hearing ensures that all interested persons can know of and be appraised of the information, prior to a hearing, upon which the Board's decision may be made.

In making a written submission, the ERCB expects that interveners will outline their position, their concerns and reasons for those concerns. Typically, submissions should indicate the interest of the interveners; that is, whether they are affected landowners, represent a public interest group, or have some other interest. The ERCB would also normally wish to know the nature of the interest which may be affected or a description of the affected land, as well as how the intervener views the project in terms of the adverse effect. It is often helpful if the submission also describes, where it is not obvious, the particular reasons for any unique concern expressed by the intervener. An intervener should as well have regard for the legislative requirements which pertain to the matter before the ERCB. If an intervener does not oppose the necessity or desirability of a proposed development, but objects on the basis of the magnitude of the impact of the development, the intervener may be disappointed to find that his interest is ultimately subjected to the greater general Alberta public interest. In such cases better success is usually had by endeavouring to assist the ERCB to arrive at some other acceptable decision.

That type of assistance can be provided to the ERCB by suggesting other reasonable alternatives, even if such alternatives are only conceptual in nature. By expressing a reasonable view as to what decision the ERCB should come to with respect to the application, the intervener may be in a better position to put the proposed development and its likely consequential impact into a realistic context. The submission may also make reference to such other matters as the intervener may consider to be relevant and appropriate.

The procedures established by the ERCB require that all written evidence to be adduced at the hearing be filed with the ERCB approximately one week prior to the hearing. With all evidence being filed in advance, and available for review by all other participants, no party is likely to be surprised or caught unprepared at the hearing, by comments or representations made by any party having an opposing interest.

2.10.1.6 Conduct of the Hearing

When the hearing commences, the ERCB will call upon all of the parties in turn to speak about their written documents and to answer questions regarding their submission. In asking participants at a hearing to speak about submissions, the ERCB does not expect that a submission will be read to the ERCB. Rather, the ERCB expects that a participant will take that opportunity to elaborate on the basis or justification for any statements made in the submission. The actual hearing, consequently, is less for the purpose of presenting evidence which is set out in the written documents than it is for participants to question the submissions of others. Although the ERCB allows the applicant and each intervener at the hearing to offer additional comments and explanation of their submission, it is expected that parties will not raise entirely new matters and will generally confine their remarks to their written submissions. After speaking about his submission an intervener will then be expected to answer questions as to any statements made, either verbally or in the written submission. This part of the process, referred to as "cross-examination", is to give all parties a fair opportunity to test the validity of the statement.

In the normal ERCB hearing the applicant, by presenting a witness or witnesses on its behalf, will be called upon first by the ERCB, to speak about the application. The witnesses will be required to answer questions posed in turn by interveners, the ERCB staff and the ERCB members. At the completion of this questioning, the applicant will be given an opportunity to present redirect evidence, which is an opportunity to elaborate upon as to the answers that the applicant's witnesses may have given to particular questions. Once that is done, the applicant's case is finished.

During the next stage of the hearing, the interveners speak in turn about their submissions and similarly answer questions with respect to those submissions. Questions of interveners may be posed by other interveners, the applicant, the ERCB staff and the ERCB members. While presenting a submission, an intervener is also entitled to comment on or contradict the evidence presented by the applicant. When each intervener has been heard in turn, the ERCB will allow the applicant, if it so chooses, to present rebuttal evidence.

Finally, after all evidence and questioning has been completed by all parties including the ERCB members and ERCB staff, the ERCB will extend, first to the interveners and lastly to the applicant, an opportunity to make summary statements or arguments. Although no obligation exists for any party to utilize the opportunity to make summary statements, that opportunity can be effectively utilized by participants of the hearing to summarize for the ERCB the key elements of their submission along with any helpful or beneficial answers to questions that they may have received or heard during the questioning process.

At the completion of the argument stage of the hearing, the ERCB normally reserves its decision on the application or matter. The time it takes the ERCB to reach a decision depends on the length of the hearing, and complexity and nature of the matters presented to it. The ERCB is required, by law to utilize the evidence presented at the hearing to formulate its decision. When the ERCB ultimately reaches a decision on the application, it is also required by law to provide written reasons for its decision and to provide copies of those written reasons to all interested parties.

It is important that persons concerned with matters before the ERCB or those potentially affected by an ERCB decision participate in the hearing process, to ensure that their views are considered by the ERCB. Once the hearing is complete and the ERCB's decision rendered, that decision is final and conclusive and is open to review only on questions of law and jurisdiction.

2.10.1.7 Interveners' Common Concerns

A number of issues commonly identified by interveners who have appeared and participated in Board hearings are worth noting:

1. Local Intervener's Cost

   Of these issues, costs in terms of time, effort and commitment to the proceeding is a substantial consideration. To some extent this difficulty has been alleviated by an authority granted to the ERCB to award costs to "local interveners" in respect of their participation in ERCB hearings. The purpose of these cost provisions is to ensure that expert technical and legal assistance, where reasonably required, can be obtained by an intervener to assist that intervener in participating in the proceeding, with the costs of such assistance being either wholly or partially compensated for by the applicant. Upon an application for costs, the ERCB as well may order some compensation to be paid to a "local intervener" in respect of time and effort expended by the intervener and for out-of-pocket expenses incurred for such things as travel, meals and accommodation. Additionally, in an appropriate case, the ERCB may make an advance of funds to an intervener, if an advance would be necessary to enable an intervener to effectively present its case to the ERCB. The ERCB's authority to award costs includes a discretion to refuse to make an award or if it makes an award to determine the amount it will award. The cost provisions are designed to encourage cooperation between hearing participants having similar interests.

2. Jurisdiction and Scope of Hearings

   Another matter of apparent difficulty for many interveners is the necessity of having to recognize the limited scope of the subject matter to be considered at a hearing. Some applications made to the ERCB, by their very nature, are self-limiting and invite particular and limited interventions. On the other hand, some applications are very wide and general in their scope, inviting interventions on numerous and varying subjects. In all cases the ERCB is constrained by its legislative authority, which authorizes the ERCB to do only those things which the legislature has by statute authorized it to do. For example, adequate and reasonable compensation for the use of an intervener's land may be important to a landowner. The ERCB, however, is not entitled to determine what constitutes adequate and reasonable compensation, for purposes of making an award of compensation, even if it should decide to approve a project. Such matters are, by legislation, dealt with by other tribunals, usually the Surface Rights Board. However, for purposes of deciding whether a project should be allowed to proceed or not, the ERCB may wish to evaluate the project on the basis of the magnitude, in a monetary sense, of the adverse impact on lands. In general terms, the Board considers that its jurisdiction encompasses matters of the environment and matters of public interest, as well as the more clearly recognized matters of conservation and orderly development. It is, however, difficult to categorize in the absence of a specific case, just how far the ERCB is authorized to go in actually determining environmental and public interest matters. In the past, the ERCB has taken the position that it has the authority to consider such matters in a general sense; that is, whether such matters are so great that they should preclude a project from proceeding. If, however, the ERCB decides the project should proceed, its jurisdiction does not extend to resolving those environmental or public interest concerns beyond conditioning the manner in which the project is developed. This does not necessarily mean such environmental or public interest issues will go unresolved. Where, at a hearing, the Board hears evidence respecting environmental matters or public interest concerns which it has no authority to resolve, the ERCB generally endeavours in its written decision to bring such matters to the attention of the government or the appropriate government department or agency.

3. ERCB Staff and Technical Assistance.

   Interveners have on occasion expressed concern as to the highly technical nature of some aspects of ERCB hearings. To alleviate this difficulty, the ERCB has, in recent cases, endeavoured to make a better use of its technical staff and public records. In some cases arrangements have been made for the ERCB's technical staff to meet with groups of interveners to explain the background and technical aspects of an application. The ERCB's public records also are a valuable source of information for interveners. This type of aid has proven useful in assisting interveners to essentially help themselves.

Due to the increased number of public hearings held by the ERCB and the substantially increased participation of the general public in those hearings, the ERCB has become more familiar with the difficulties which frequently face interveners. Although interests presented at a hearing may be irreconcilable, the ERCB is endeavouring, where possible, to simplify the process. The ERCB has held in appropriate cases, pre-hearing meetings between interveners and its staff. At these meetings, the ERCB's staff are able to explain and answer questions with respect to hearing procedures. Such meetings have also proven useful in coordinating the various interveners' involvement in a hearing with a minimum of time commitment. The lengthy time commitment to a hearing is perhaps the interveners' most common complaint as to the ERCB hearing process.

Most interveners are usually anxious to appear at the hearing, make their representations and complete their involvement. At a minimum, interveners want to know in advance when the appropriate time would be for them to appear. Where many interveners are involved and the hearing is likely to be lengthy, this matter can become a significant concern. From the ERCB's point of view it can do little more than to sympathize with such concerns. As the ERCB is unable to predict how lengthy either the applicant or interveners are likely to be in their presentations or questioning, the duration of the hearing can only be estimated in very general terms and this of course makes it very nearly impossible to schedule any intervener to be heard at a particular time or even on a particular day.

Information available on the public hearing process includes:

1. **The ERCB Public Hearing Process, G-16**

   Information: Describes the purpose, scope and intent of the public hearing process.

   Available: The Energy Resources Conservation Board
   phone: (403) 261-8311

2. **Having Your Say at an ERCB Public Hearing, ENERFAX Factsheet No. 2**

   Information: Explains the purposes of ERCB hearings and how to take part effectively.

   Available: The Energy Resources Conservation Board
   phone: (403) 261-8311

2.10.2 RURAL RELATIONS

Through the Surface Rights Act, the government may permit others to use all or part of privately owned (patented) land. This Act is based on the assumption that the owner of mineral rights has the right to enter upon the land held by the surface owner in order to work there and remove the minerals. Since private negotiations form the basis for reaching agreement, it is in the proponent's interest to reach this agreement expediently and on good terms.

Generally there are two areas where contracts have to be negotiated between the rural landowner and the petroleum company. These two areas are:

1. The Surface Lease Agreement
2. The Right-of-Way Agreement

The surface lease agreement covers all surface operations on a piece of property (e.g. seismic operations, wells and production facilities) except pipelines. Pipelines cross property boundaries and therefore a right-of-way agreement is necessary.

The following items should also be noted:

1. Site-specific developments involve the public through surface rights agreements. In other words, if a well is being drilled and it only affects one site and one landowner then a surface rights agreement is the only public interface. If, however, the well is sour gas and the surrounding public is involved, a public hearing may be necessary.
2. Ownership of land does not mean that the landowner has exclusive rights to the minerals and resources below the surface. The province of Alberta has legislation under the Surface Rights Act but this Act is only used if the landowner and the company exploring for the minerals below the ground cannot agree on surface rights. If surface rights cannot be agreed upon the dispute is resolved by the Surface Rights Board which administers the Surface Rights Act.
3. The owner should be informed that a survey will take place on his property. Surveyors have the right to come on the land to conduct a survey after they have made a reasonable attempt to give notice to that effect to the landowner or occupant. Any damages done to crops or otherwise done during the course of the survey must be paid for by the company.
4. A surface lease offer should be made to the landowner to determine the amount of compensation for use of land taken out of agricultural production. In general, the amount of compensation is determined by the present land use and yield on adjacent lands.
5. The land agent, either an employee of the company or an independent land agent, approaches the landowners and offers a surface lease. By this time the company has either conducted a survey of the area of interest or informed the owner that a survey will take place.

   The surface lease for a facility including roadway should have attached to it a map of the survey outlining the area the company wishes to obtain and also a completed agreement outlining the compensation it is prepared to pay. Under the Land Agents Licensing Act, this document is to be left in the landowner's possession for a clear period of 48 hours (not including Sundays or legal holidays) before he can resume negotiations. This does not preclude the landman from obtaining the opinion of the landowner as it pertains to the company's offer nor does it prevent the landowner from waiving the 48-hour condition so that negotiations can begin immediately. The 48-hour waiting period is provided for the landowner's protection and should be used to carefully study the document and the compensation offered.

   Facility locations are for the most part chosen on the basis of the operator's geological interpretation and the well spacing and target area requirements set out by the Energy Resources Conservation Board (ERCB).

   If an agreement respecting the well site location and access road is reached, the operation can apply to the ERCB for a well licence. If a licence is issued the operator can commence its operations if a surface lease has been signed. If a lease has not been signed the proponent may apply to the Surface Rights Board for a Right of Entry Order.
6. Prior to construction or site preparation, the proponent and the landowner should attempt to come to some agreement as to the method to be used to preserve as much topsoil as possible on a pipeline, power line or facility area.

   Prior to or during construction or site preparation of a facility, pipeline or power line, if there is any indication that proper construction methods are not being followed, the landowner should contact Alberta Environment. In instances where a lease is being abandoned, the company must obtain a Reclamation Certificate from Alberta Environment before they can surrender or terminate their surface lease or rights-of-entry order (annual payment, if applicable, continues until this is done).
7. Overhead or underground powerlines should be agreed upon with the landowner prior to construction.
8. The use of herbicides should also be agreed upon with the landowner.
9. Regarding right-of-way agreements, the major issues are:
   a) the nature of the rights such as routing, width, number of pipelines or transmission lines
   b) compensation

c) liability for damages such as topsoil conservation, damage to crops, and surface drainage.

10. Regarding surface rights, the major issues are:
    a) damage to water wells by seismic shot holes or drilling
    b) property damage
    c) damage to municipal road access or damage as a result of limited municipal road access.

The proponent must be aware that it is liable for any damage.

Further information on rural public involvement and concerns includes:

(Note: All documents can be obtained from the Farmers Advocate, phone: 427-2433)

1. **Negotiating Surface Rights**

   Information: Explains surface rights and compensation for a rural resident.

2. **Seismic Operations and Farmers Rights**

   Information: Explains surface rights and common concerns.

3. **Well Site Selection and the Surface Owner**

   Information: Explains well spacing units and target areas.

4. **Surface Rights in Alberta**

   Information: Explains the legislation.

5. **Pipeline and Surface Rights**

   Information: Explains the right-of-way agreement process and public hearings through a question and answer format.

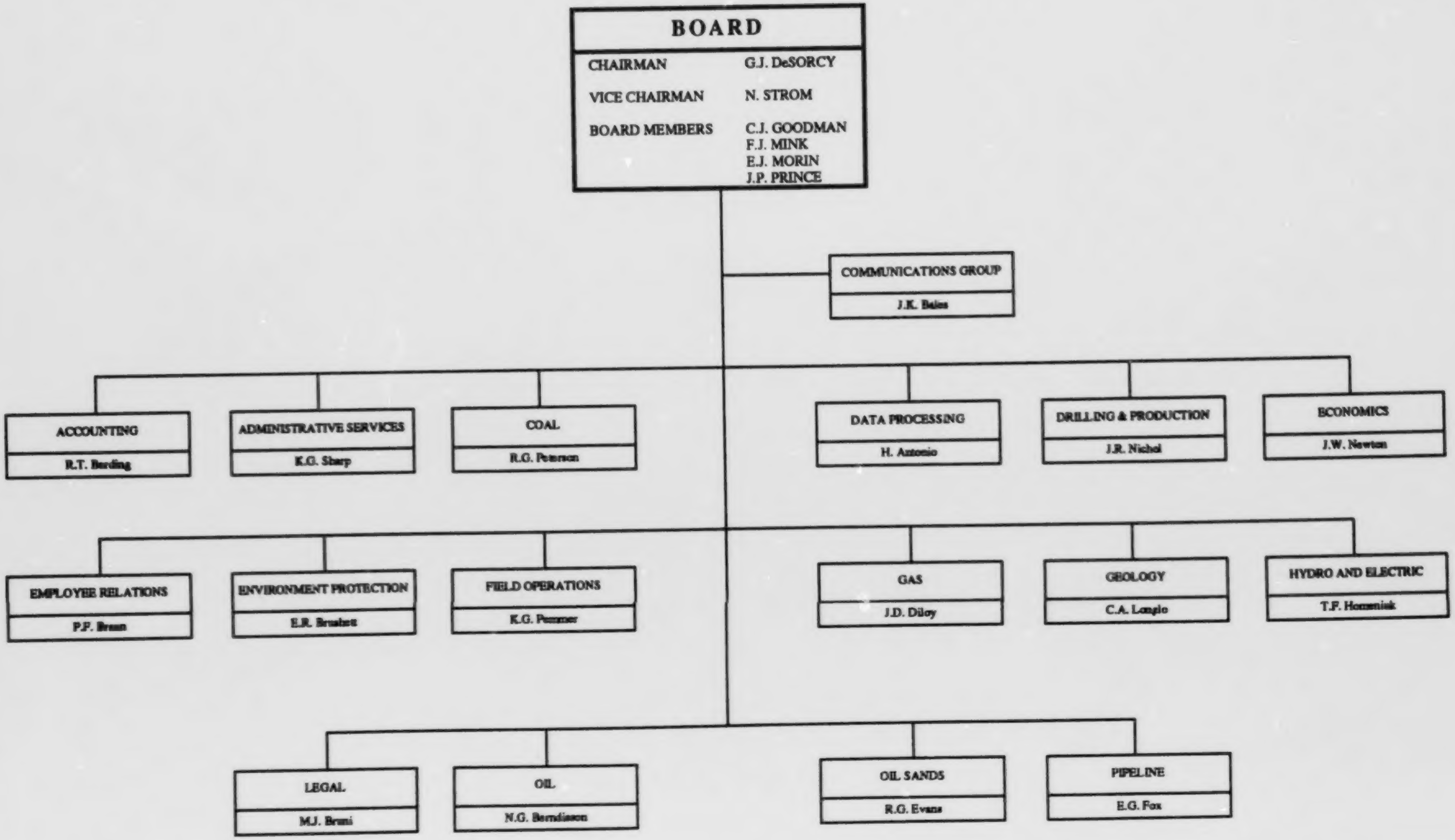

BOARD
CHAIRMAN
G.J. DeSORCY
VICE CHAIRMAN
N. STROM
BOARD MEMBERS
C.J. GOODMAN
F.J. MINK
E.J. MORIN
J.P. PRINCE
COMMUNICATIONS GROUP
J.K. Bales
ACCOUNTING
R.T. Berding
ADMINISTRATIVE SERVICES
K.G. Sharp
COAL
R.G. Peterson
DATA PROCESSING
H. Antonio
DRILLING & PRODUCTION
J.R. Nichol
ECONOMICS
J.W. Newton
EMPLOYEE RELATIONS
P.F. Brean
ENVIRONMENT PROTECTION
E.R. Brushett
FIELD OPERATIONS
K.G. Pemmer
GAS
J.D. Dilay
GEOLOGY
C.A. Langlo
HYDRO AND ELECTRIC
T.F. Homeniuk
LEGAL
M.J. Bruni
OIL
N.G. Berndtsson
OIL SANDS
R.G. Evans
PIPELINE
E.G. Fox

Figure 2.1
ENERGY RESOURCES CONSERVATION BOARD ORGANIZATION
(Reference ERCB, 1988)

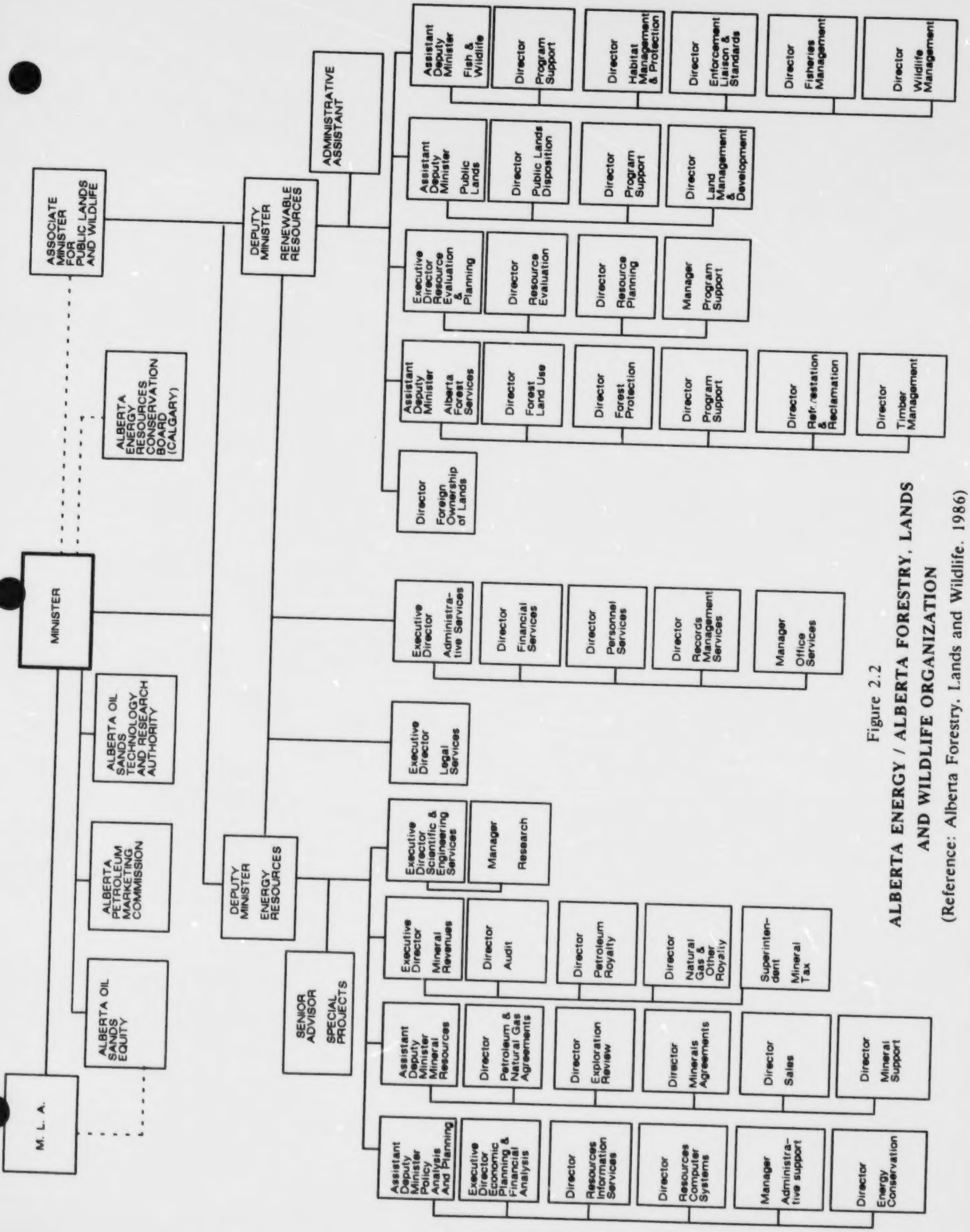

M. L. A.
MINISTER
ALBERTA OIL SANDS EQUITY
ALBERTA PETROLEUM MARKETING COMMISSION
ALBERTA OIL SANDS TECHNOLOGY AND RESEARCH AUTHORITY
ALBERTA ENERGY RESOURCES CONSERVATION BOARD (CALGARY)
ASSOCIATE MINISTER FOR PUBLIC LANDS AND WILDLIFE
DEPUTY MINISTER ENERGY RESOURCES
SENIOR ADVISOR SPECIAL PROJECTS
DEPUTY MINISTER RENEWABLE RESOURCES
ADMINISTRATIVE ASSISTANT
Assistant Deputy Minister Policy Analysis And Planning
Executive Director Economic Planning & Financial Analysis
Director Resources Information Services
Director Resources Computer Systems
Manager Administrative support
Director Energy Conservation
Assistant Deputy Minister Mineral Resources
Director Petroleum & Natural Gas Agreements
Director Exploration Review
Director Minerals Agreements
Director Sales
Director Mineral Support
Executive Director Mineral Revenues
Director Audit
Director Petroleum Royalty
Director Natural Gas & Other Royalty
Superintendent Mineral Tax
Executive Director Scientific & Engineering Services
Manager Research
Executive Director Legal Services
Executive Director Administrative Services
Director Financial Services
Director Personnel Services
Director Records Management Services
Manager Office Services
Director Foreign Ownership of Lands
Assistant Deputy Minister Alberta Forest Services
Director Forest Land Use
Director Forest Protection
Director Program Support
Director Refforestation & Reclamation
Director Timber Management
Executive Director Resource Evaluation & Planning
Director Resource Evaluation
Director Resource Planning
Manager Program Support
Assistant Deputy Minister Public Lands
Director Public Lands Disposition
Director Program Support
Director Land Management & Development
Assistant Deputy Minister Fish & Wildlife
Director Program Support
Director Habitat Management & Protection
Director Enforcement Liaison & Standards
Director Fisheries Management
Director Wildlife Management

Figure 2.2

ALBERTA ENERGY / ALBERTA FORESTRY, LANDS AND WILDLIFE ORGANIZATION

(Reference: Alberta Forestry, Lands and Wildlife, 1986)

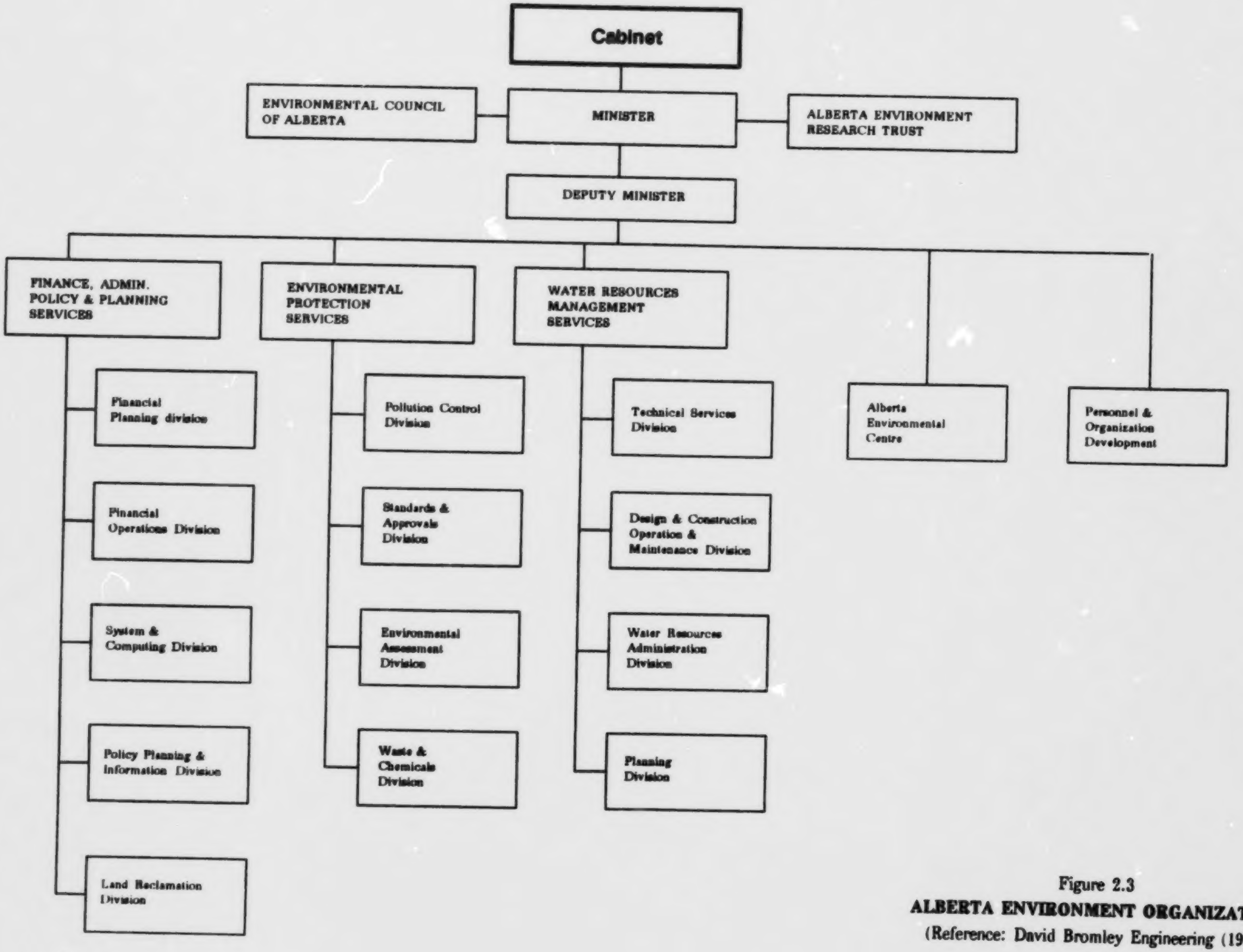

Cabinet
ENVIRONMENTAL COUNCIL OF ALBERTA
MINISTER
ALBERTA ENVIRONMENT RESEARCH TRUST
DEPUTY MINISTER
FINANCE, ADMIN. POLICY & PLANNING SERVICES
ENVIRONMENTAL PROTECTION SERVICES
WATER RESOURCES MANAGEMENT SERVICES
Alberta Environmental Centre
Personnel & Organization Development
Financial Planning division
Financial Operations Division
System & Computing Division
Policy Planning & Information Division
Land Reclamation Division
Pollution Control Division
Standards & Approvals Division
Environmental Assessment Division
Waste & Chemicals Division
Technical Services Division
Design & Construction Operation & Maintenance Division
Water Resources Administration Division
Planning Division

Figure 2.3
ALBERTA ENVIRONMENT ORGANIZATION
(Reference: David Bromley Engineering (1983) Ltd.)

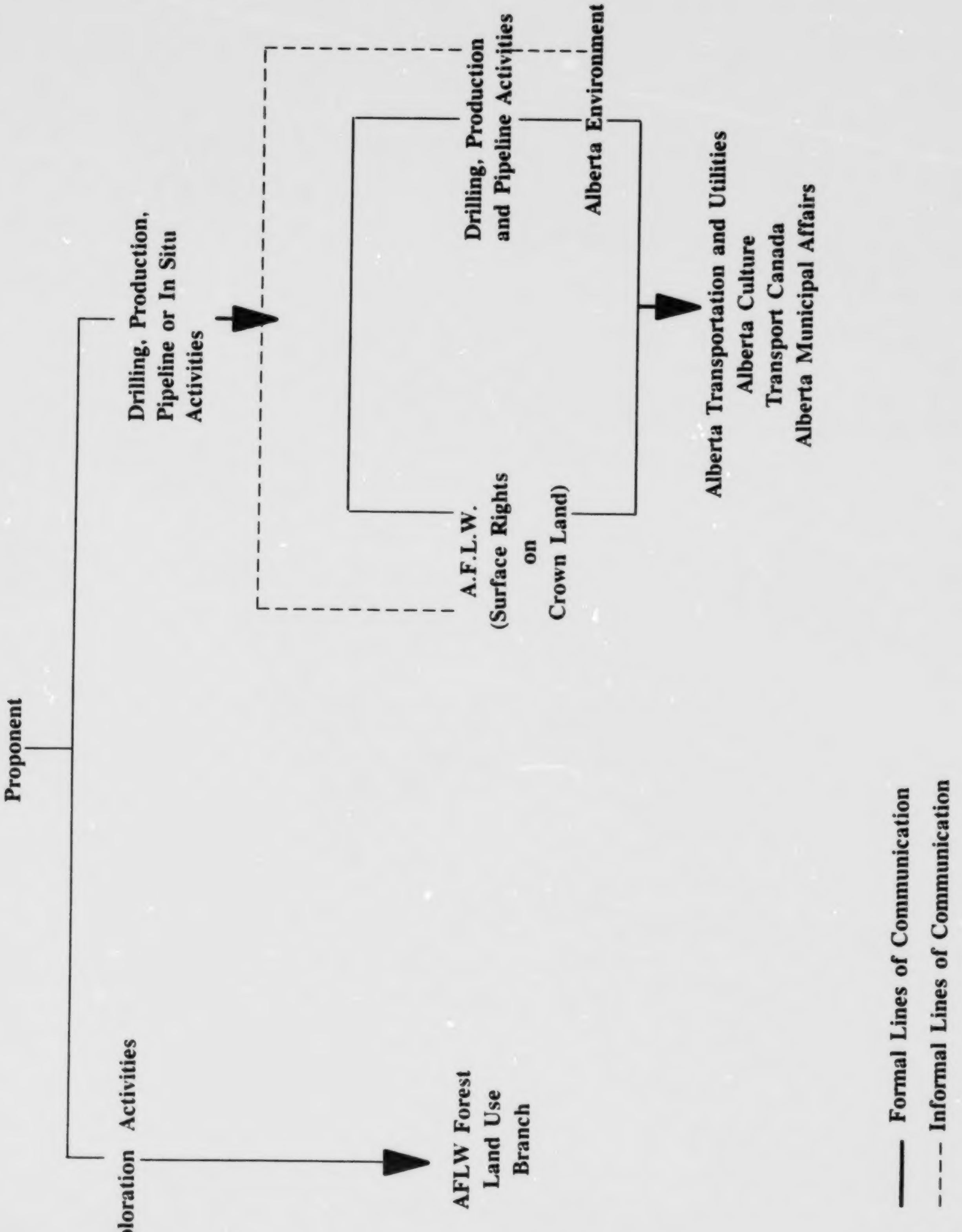

Proponent
Exploration Activities
AFLW Forest Land Use Branch
Drilling, Production, Pipeline or In Situ Activities
A.F.L.W. (Surface Rights on Crown Land)
Drilling, Production and Pipeline Activities
Alberta Environment
Alberta Transportation and Utilities
Alberta Culture
Transport Canada
Alberta Municipal Affairs
Formal Lines of Communication
Informal Lines of Communication

Figure 2.4

OVERALL RELATIONSHIP OF
ENERGY RESOURCES CONSERVATION BOARD (E.R.C.B)
ALBERTA FORESTRY LANDS AND WILDLIFE (A.F.L.W.)
AND ALBERTA ENVIRONMENT (A.E.)
(Reference: David Bromley Engineering (1983) Ltd.)

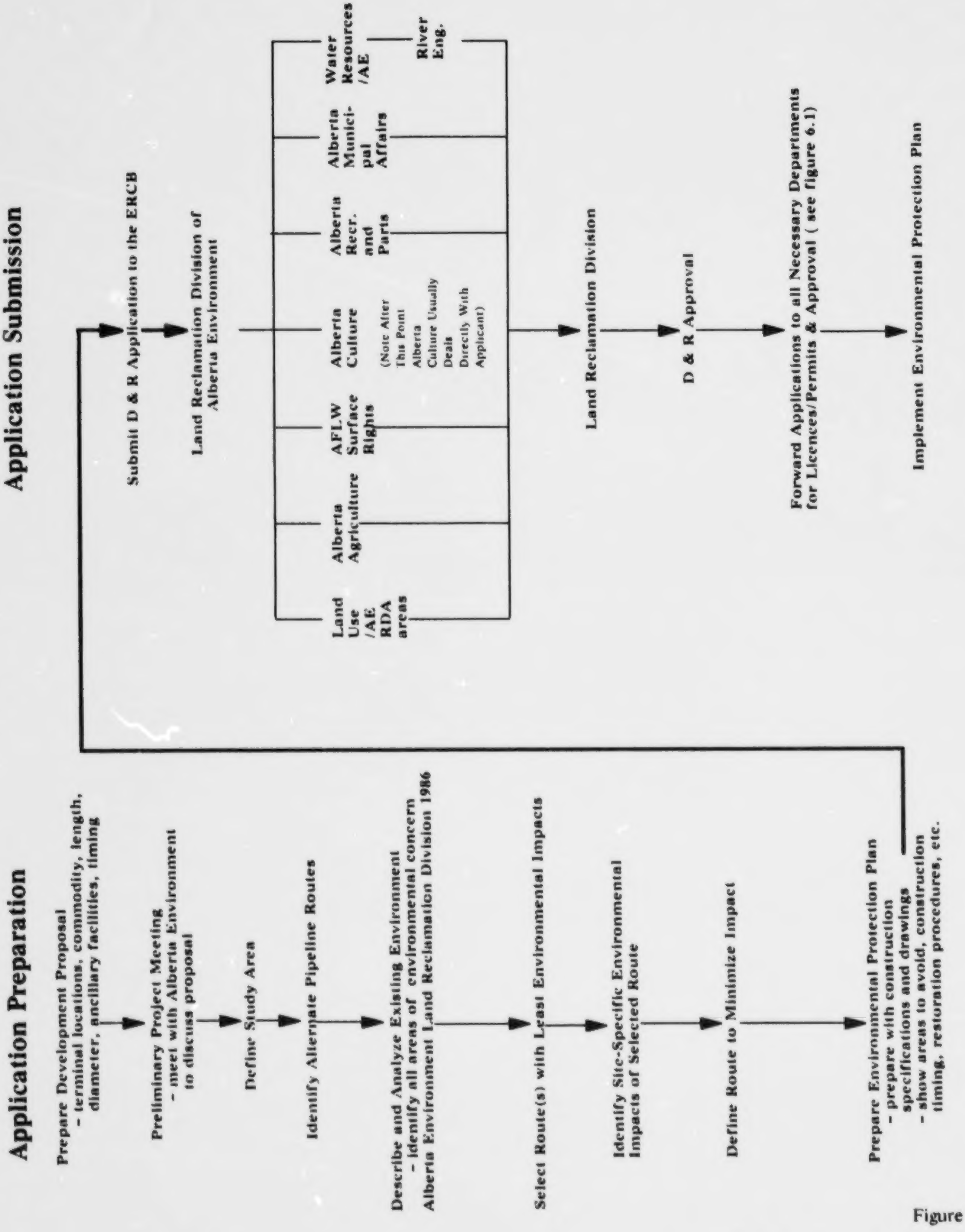
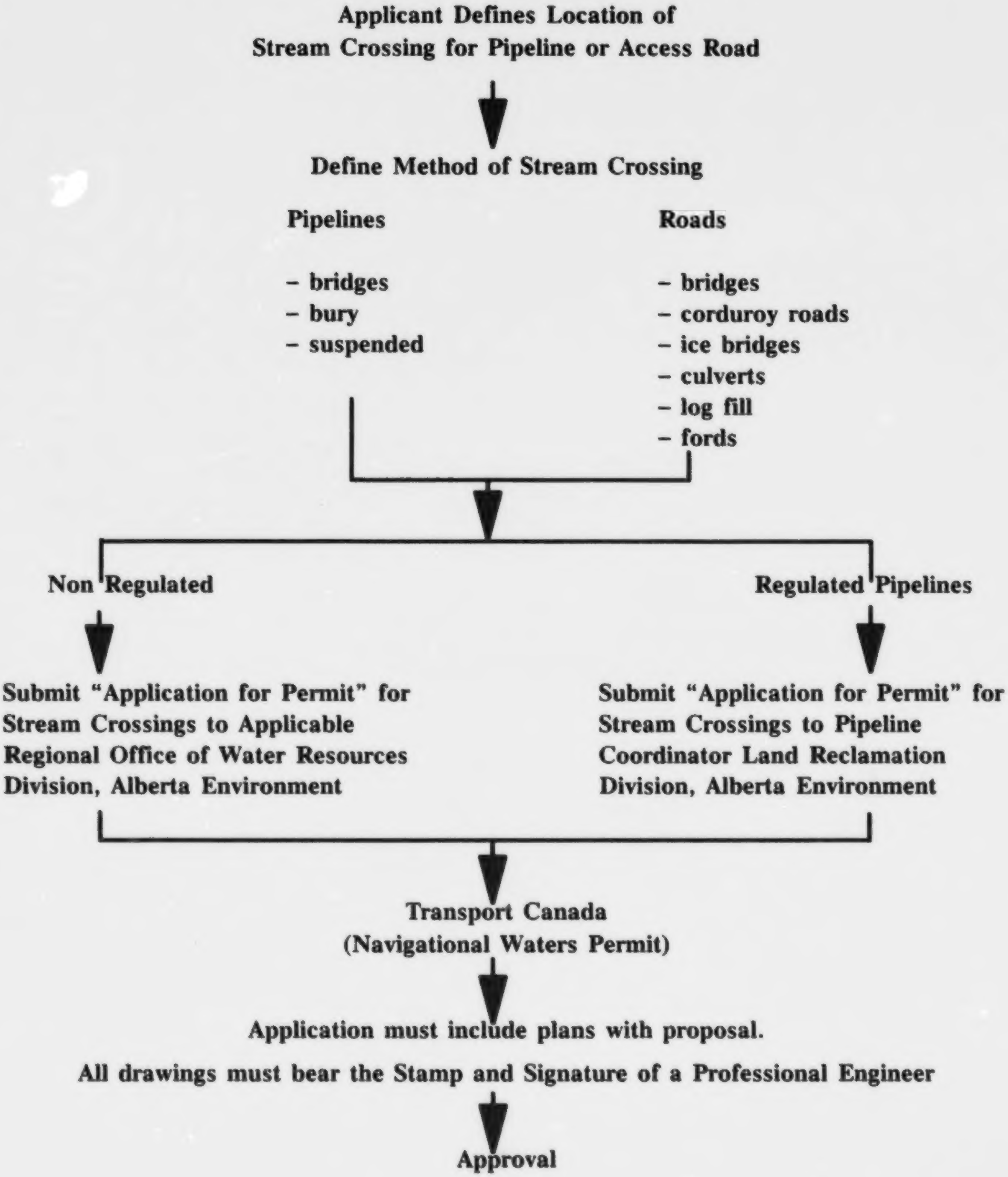

Application Preparation
Prepare Development Proposal
- terminal locations, commodity, length, diameter, ancillary facilities, timing
Preliminary Project Meeting
- meet with Alberta Environment to discuss proposal
Define Study Area
Identify Alternate Pipeline Routes
Describe and Analyze Existing Environment
- identify all areas of environmental concern
Alberta Environment Land Reclamation Division 1986
Select Route(s) with Least Environmental Impacts
Identify Site-Specific Environmental Impacts of Selected Route
Define Route to Minimize Impact
Prepare Environmental Protection Plan
- prepare with construction specifications and drawings
- show areas to avoid, construction timing, restoration procedures, etc.
Application Submission
Submit D & R Application to the ERCB
Land Reclamation Division of Alberta Environment
Land Use /AE RDA areas
Alberta Agriculture
AFLW Surface Rights
Alberta Culture
(Note After This Point Alberta Culture Usually Deals Directly With Applicant)
Alberta Recr. and Parks
Alberta Munici- pal Affairs
Water Resources /AE
River Eng.
Land Reclamation Division
D & R Approval
Forward Applications to all Necessary Departments for Licences/Permits & Approval (see figure 6.1)
Implement Environmental Protection Plan

Figure 2.5

APPLICATION PROCEDURES
DEVELOPMENT & RECLAMATION (D & R) APPROVALS

(Reference: David Bromley Engineering (1983) Ltd.)

Application Procedure



Applicant Defines Location of
Stream Crossing for Pipeline or Access Road

Define Method of Stream Crossing

Pipelines

- bridges
- bury
- suspended

Roads

- bridges
- corduroy roads
- ice bridges
- culverts
- log fill
- fords

Non Regulated

Submit "Application for Permit" for Stream Crossings to Applicable Regional Office of Water Resources Division, Alberta Environment

Regulated Pipelines

Submit "Application for Permit" for Stream Crossings to Pipeline Coordinator Land Reclamation Division, Alberta Environment

Transport Canada
(Navigational Waters Permit)

Application must include plans with proposal.

All drawings must bear the Stamp and Signature of a Professional Engineer

Approval

Figure 2.6
STREAM CROSSING
APPLICATION PROCEDURE

(reference:David Bromley Engineering (1983) Ltd.)

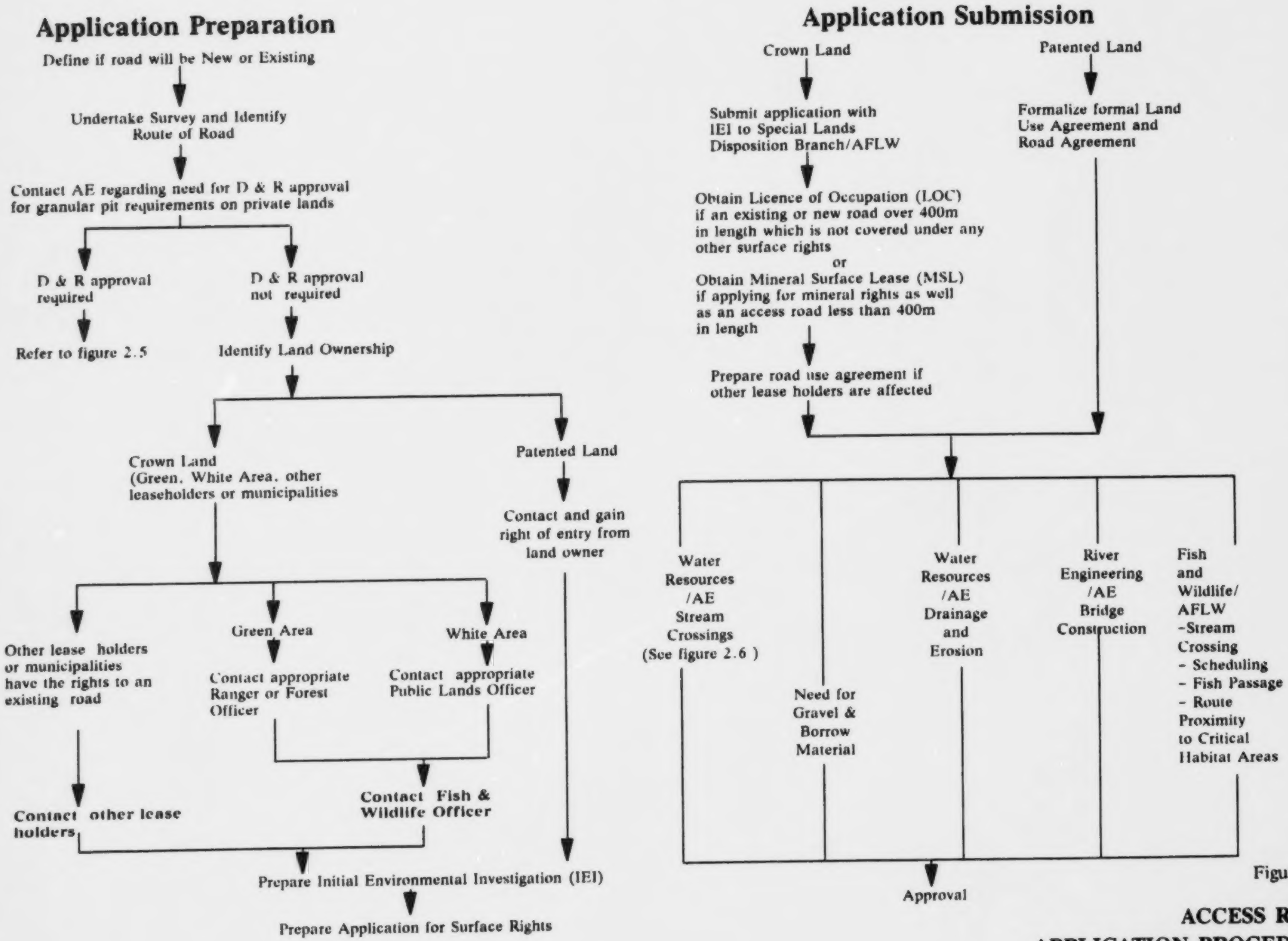
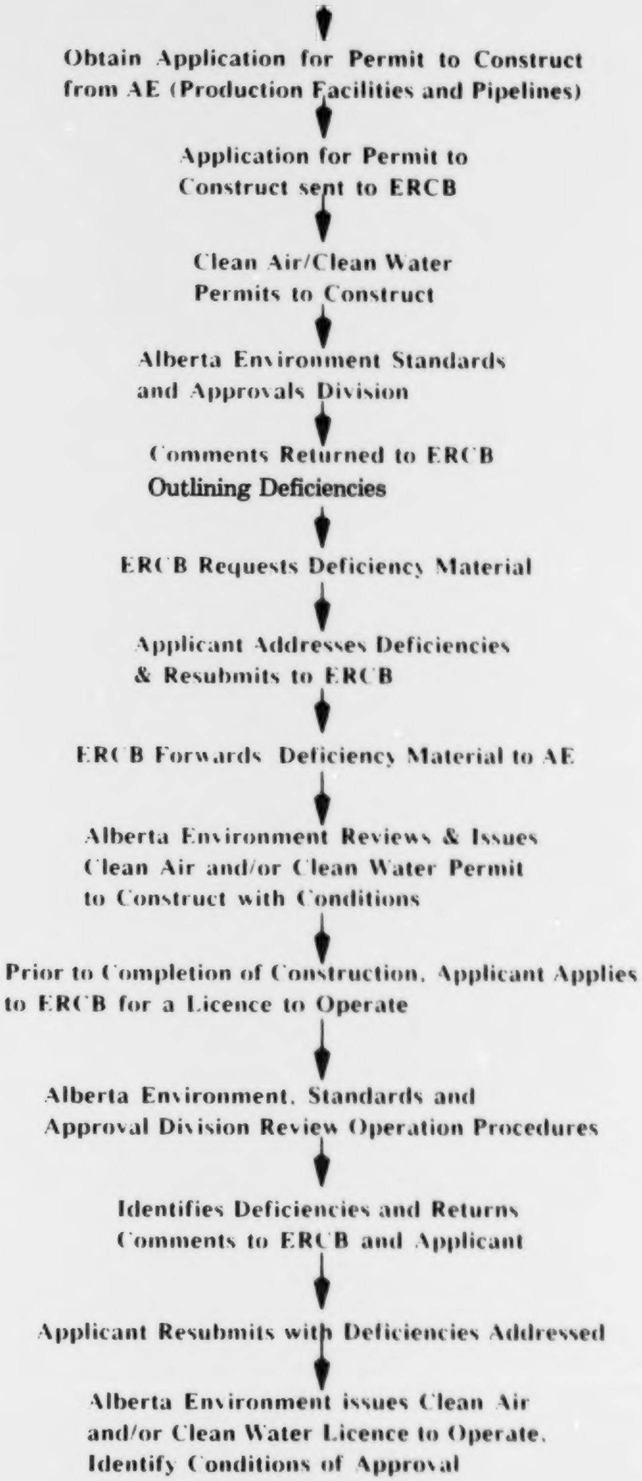

Application Preparation
Define if road will be New or Existing
Undertake Survey and Identify Route of Road
Contact AE regarding need for D & R approval for granular pit requirements on private lands
D & R approval required
Refer to figure 2.5
D & R approval not required
Identify Land Ownership
Crown Land (Green, White Area, other leaseholders or municipalities
Patented Land
Contact and gain right of entry from land owner
Other lease holders or municipalities have the rights to an existing road
Contact other lease holders
Green Area
Contact appropriate Ranger or Forest Officer
White Area
Contact appropriate Public Lands Officer
Contact Fish & Wildlife Officer
Prepare Initial Environmental Investigation (IEI)
Prepare Application for Surface Rights
Application Submission
Crown Land
Submit application with IEI to Special Lands Disposition Branch/AFLW
Obtain Licence of Occupation (LOC) if an existing or new road over 400m in length which is not covered under any other surface rights
or
Obtain Mineral Surface Lease (MSL) if applying for mineral rights as well as an access road less than 400m in length
Prepare road use agreement if other lease holders are affected
Patented Land
Formalize formal Land Use Agreement and Road Agreement
Water Resources /AE Stream Crossings (See figure 2.6)
Need for Gravel & Borrow Material
Water Resources /AE Drainage and Erosion
River Engineering /AE Bridge Construction
Fish and Wildlife/ AFLW -Stream Crossing - Scheduling - Fish Passage - Route Proximity to Critical Habitat Areas
Approval

Figure 2.7

ACCESS ROAD
APPLICATION PROCEDURE

(reference: David Bromley Engineering (1983) Ltd.)

PERMITS TO CONSTRUCT/LICENCES TO OPERATE



Obtain Application for Permit to Construct from AE (Production Facilities and Pipelines)

Application for Permit to Construct sent to ERCB

Clean Air/Clean Water Permits to Construct

Alberta Environment Standards and Approvals Division

Comments Returned to ERCB Outlining Deficiencies

ERCB Requests Deficiency Material

Applicant Addresses Deficiencies & Resubmits to ERCB

ERCB Forwards Deficiency Material to AE

Alberta Environment Reviews & Issues Clean Air and/or Clean Water Permit to Construct with Conditions

Prior to Completion of Construction, Applicant Applies to ERCB for a Licence to Operate

Alberta Environment, Standards and Approval Division Review Operation Procedures

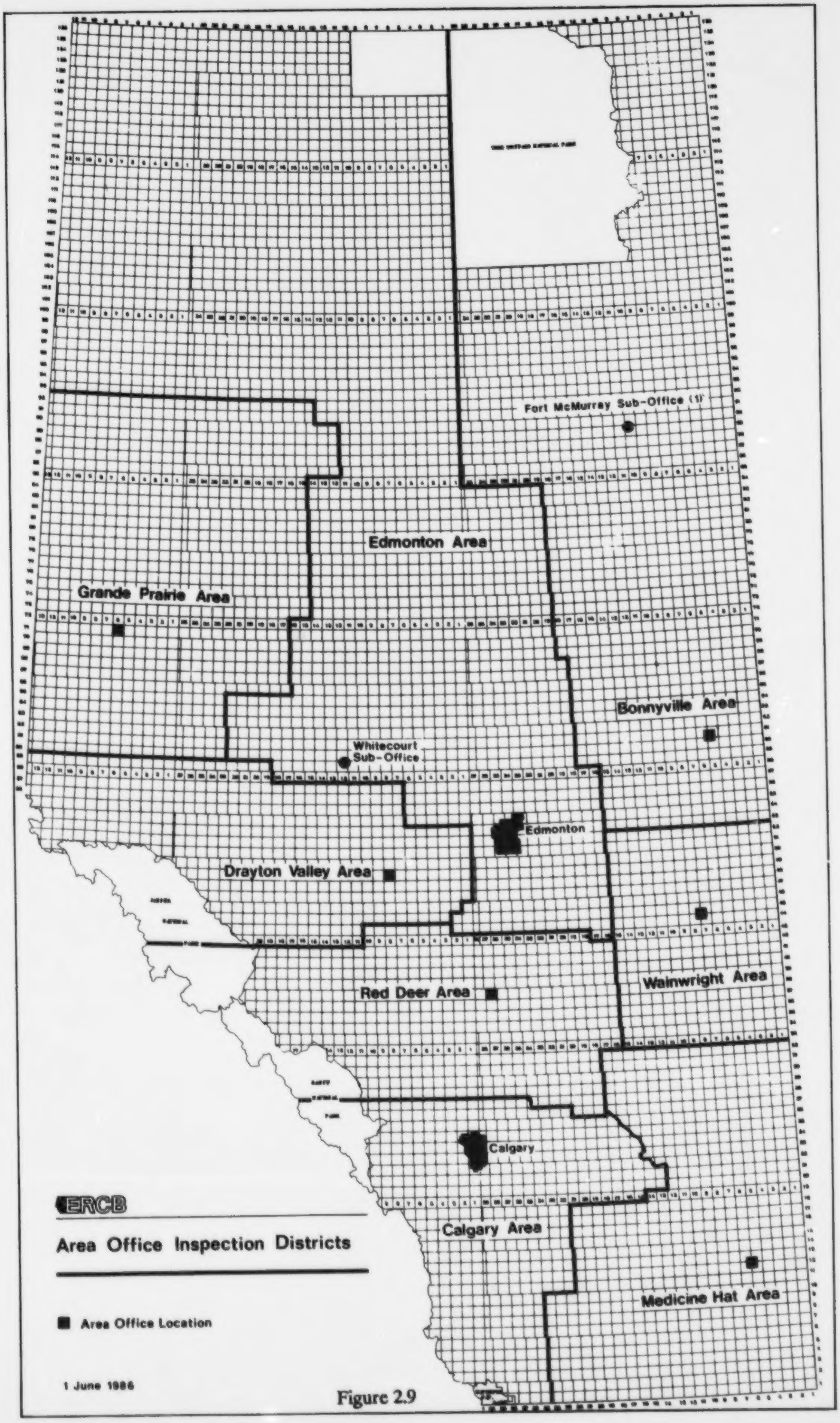
Identifies Deficiencies and Returns Comments to ERCB and Applicant

Applicant Resubmits with Deficiencies Addressed

Alberta Environment issues Clean Air and/or Clean Water Licence to Operate. Identify Conditions of Approval

Figure 2.8
CLEAN AIR & WATER ACTS
- PERMIT TO CONSTRUCT AND LICENCE TO OPERATE
— APPLICATION PROCEDURE

(Reference: David Bromley Engineering (1983) Ltd.)


Wood Buffalo National Park
Fort McMurray Sub-Office (1)
Edmonton Area
Grande Prairie Area
Bonnyville Area
Whitecourt Sub-Office
Edmonton
Drayton Valley Area
Jasper National Park
Red Deer Area
Wainwright Area
Banff National Park
Calgary
Calgary Area
Medicine Hat Area

ERCB

Area Office Inspection Districts

■ Area Office Location

1 June 1986

Figure 2.9

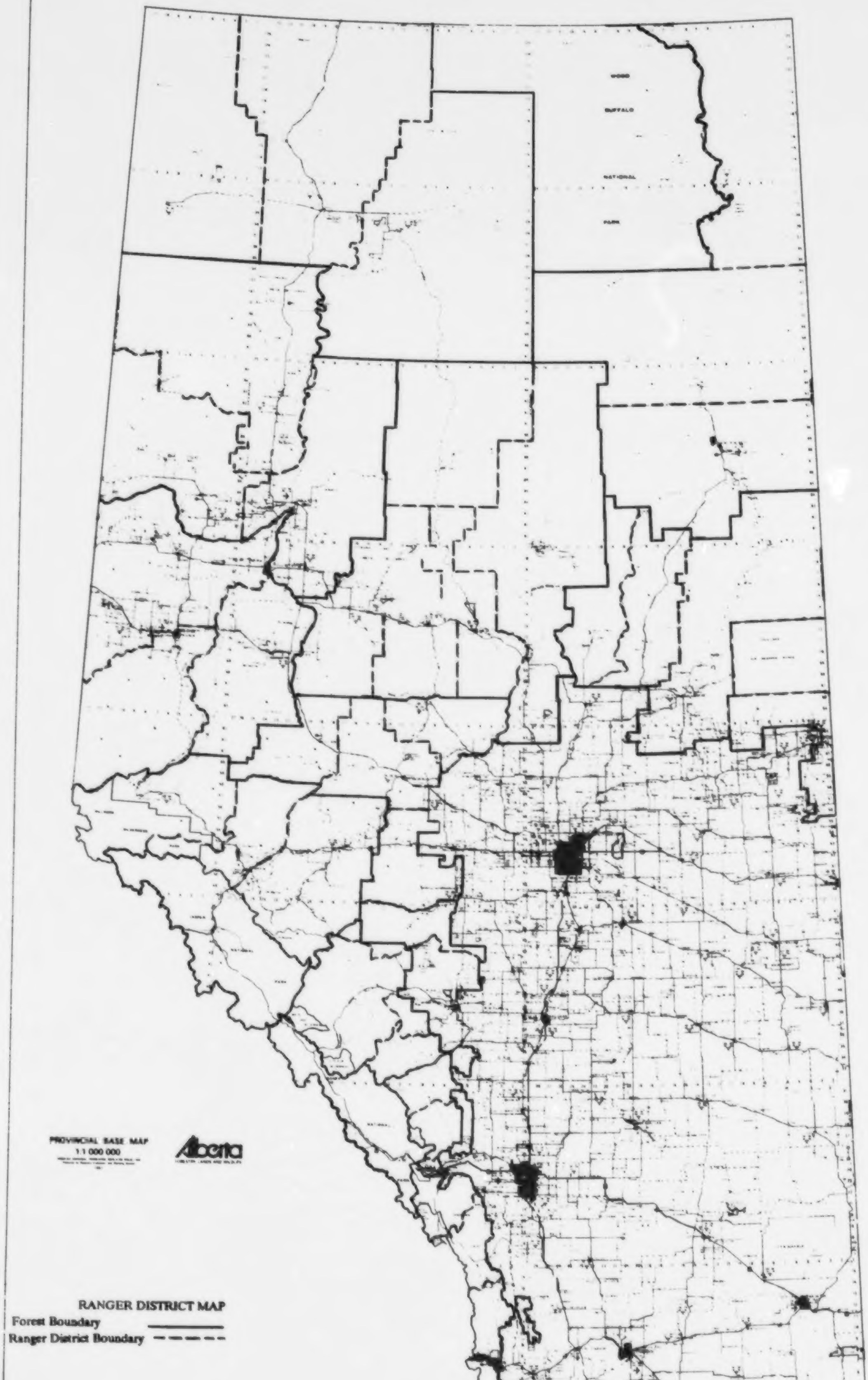

WOOD
BUFFALO
NATIONAL
PARK
PROVINCIAL BASE MAP
1:1 000 000
Alberta
RANGER DISTRICT MAP
Forest Boundary
Ranger District Boundary

Figure 2.10

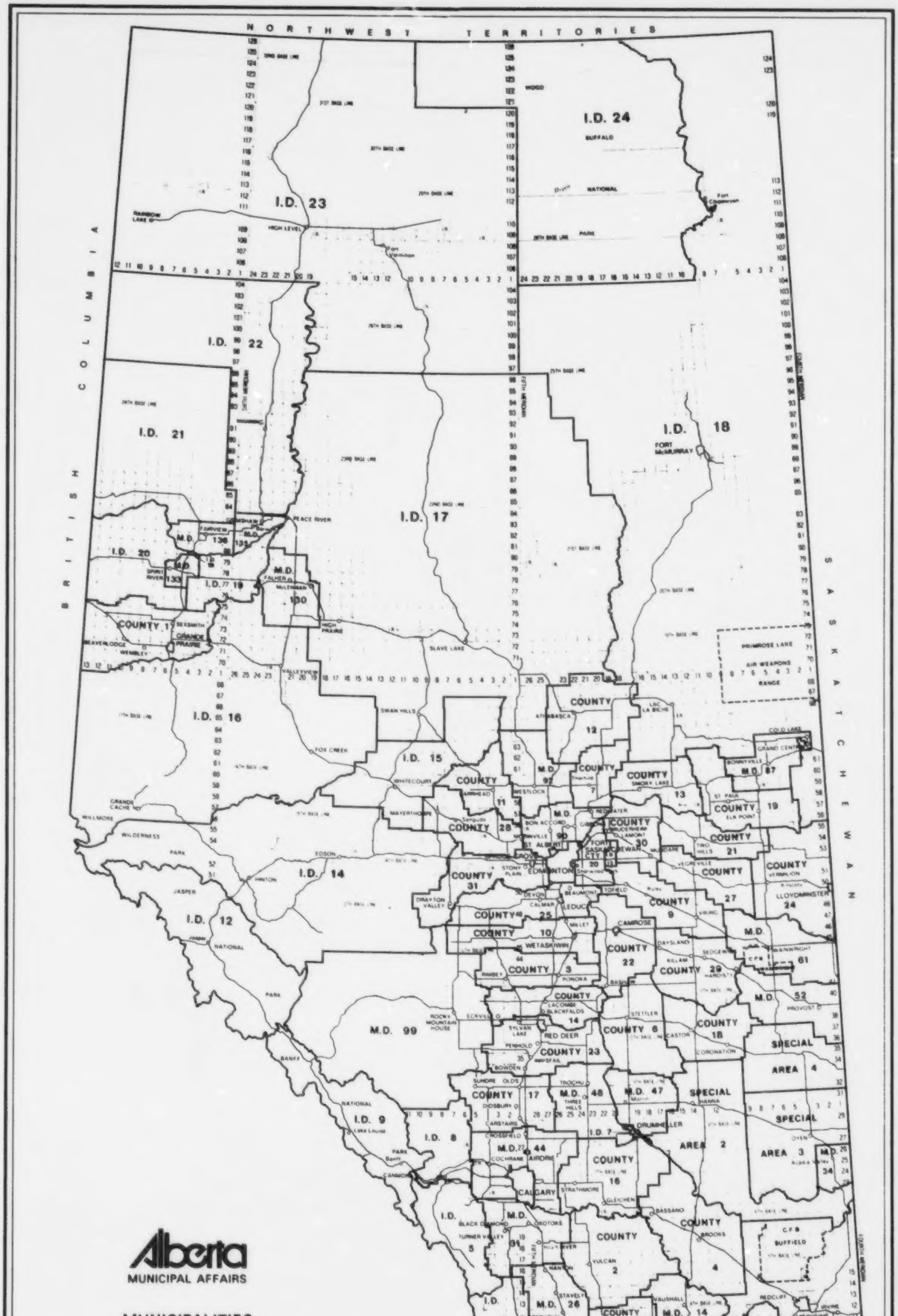

NORTHWEST TERRITORIES
BRITISH COLUMBIA
SASKATCHEWAN
MONTANA
Alberta
MUNICIPAL AFFAIRS
MUNICIPALITIES
1986
I.D. 24
I.D. 23
I.D. 22
I.D. 21
I.D. 20
I.D. 18
I.D. 17
I.D. 16
I.D. 15
I.D. 14
I.D. 12
I.D. 9
I.D. 8
I.D. 7
I.D. 5
I.D. 6
M.D. 99
M.D. 130
M.D. 136
COUNTY 1
COUNTY 12
COUNTY 11
COUNTY 28
COUNTY 31
COUNTY 13
COUNTY 19
COUNTY 21
COUNTY 24
COUNTY 9
COUNTY 22
COUNTY 29
COUNTY 3
COUNTY 10
COUNTY 25
COUNTY 14
COUNTY 6
COUNTY 18
COUNTY 23
COUNTY 17
COUNTY 16
COUNTY 2
COUNTY 4
COUNTY 8
COUNTY 5
M.D. 92
M.D. 87
M.D. 90
M.D. 61
M.D. 52
M.D. 48
M.D. 47
M.D. 44
M.D. 31
M.D. 26
M.D. 14
M.D. 6
M.D. 1
M.D. 34
SPECIAL AREA 4
SPECIAL AREA 2
SPECIAL AREA 3
FORT McMURRAY
PEACE RIVER
GRANDE PRAIRIE
EDMONTON
RED DEER
CALGARY
DRUMHELLER
LETHBRIDGE
MEDICINE HAT
LLOYDMINSTER
CAMROSE
JASPER
BANFF
PRIMROSE LAKE AIR WEAPONS RANGE
CFB SUFFIELD
PRODUCED BY THE ALBERTA BUREAU OF SURVEYING AND MAPPING © 1986

Figure 2.11

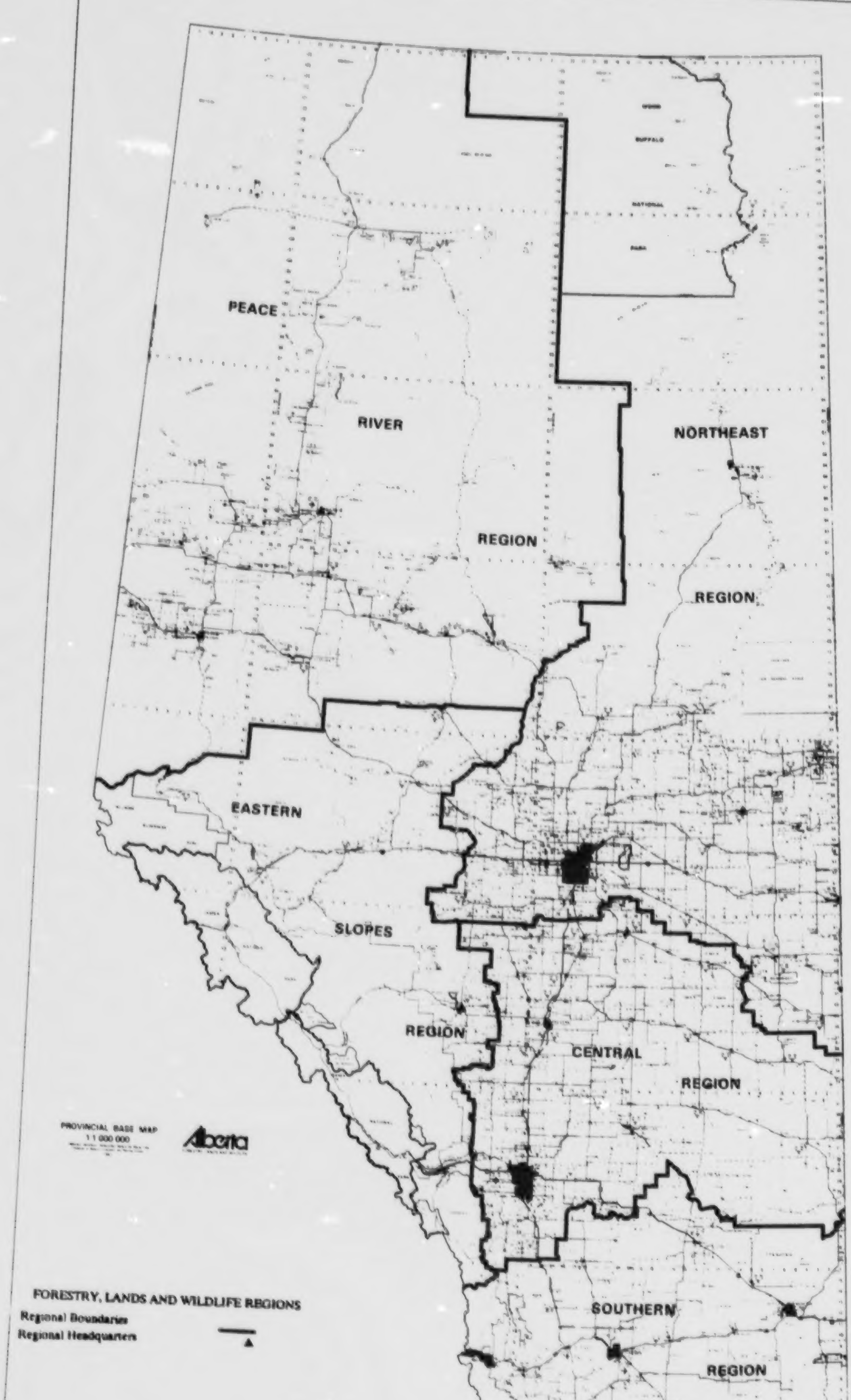
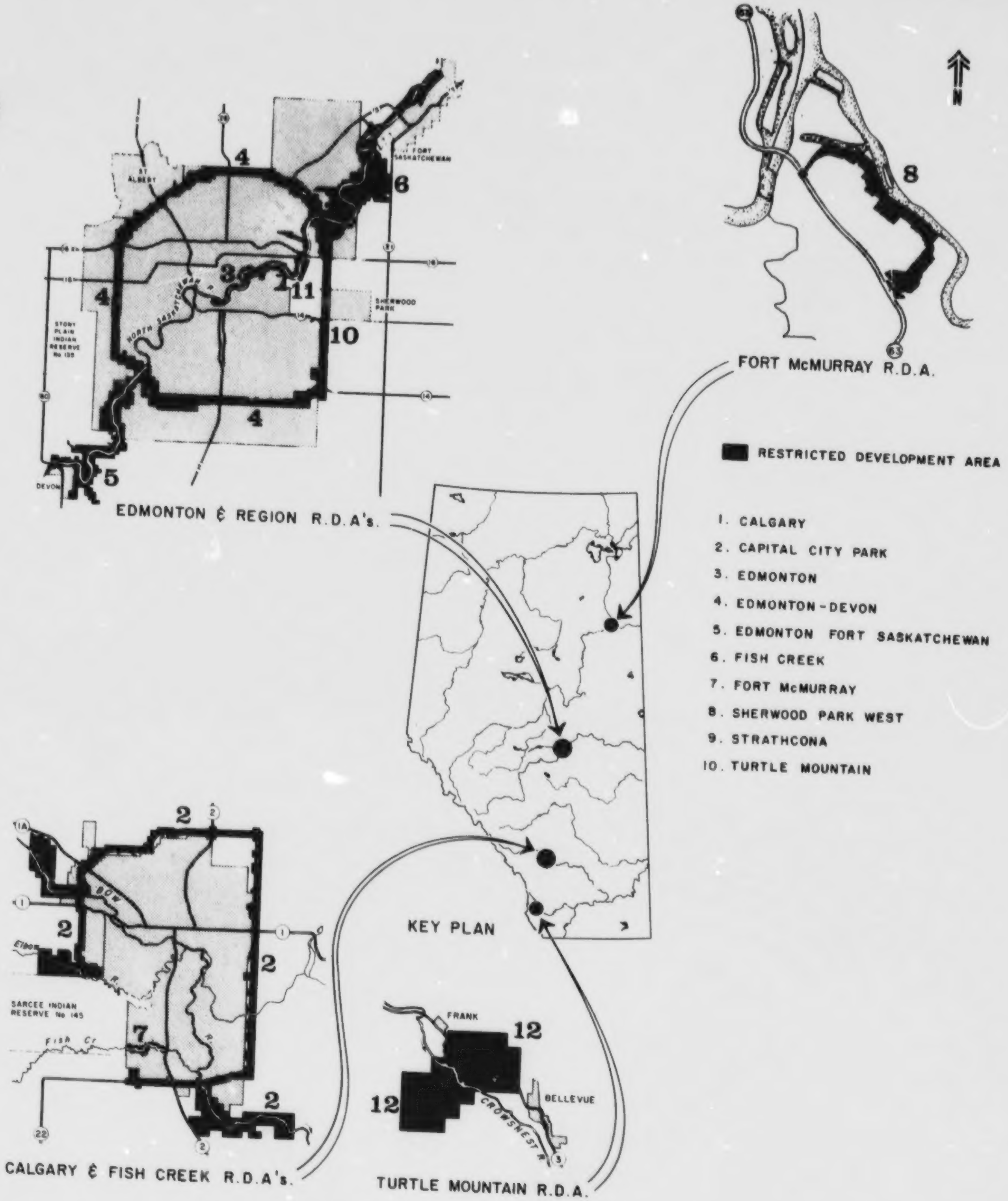

WOOD
BUFFALO
NATIONAL
PARK
PEACE
RIVER
REGION
NORTHEAST
REGION
EASTERN
SLOPES
REGION
CENTRAL
REGION
SOUTHERN
REGION
PROVINCIAL BASE MAP
1:1 000 000
Alberta
FORESTRY, LANDS AND WILDLIFE REGIONS
Regional Boundaries
Regional Headquarters
▲

Figure 2.12



FORT McMURRAY R.D.A.
8
N
63
EDMONTON & REGION R.D.A's.
ST. ALBERT
FORT SASKATCHEWAN
STONY PLAIN INDIAN RESERVE No 135
NORTH SASKATCHEWAN
SHERWOOD PARK
DEVON
4
6
3
11
10
5
RESTRICTED DEVELOPMENT AREA
1. CALGARY
2. CAPITAL CITY PARK
3. EDMONTON
4. EDMONTON-DEVON
5. EDMONTON FORT SASKATCHEWAN
6. FISH CREEK
7. FORT McMURRAY
8. SHERWOOD PARK WEST
9. STRATHCONA
10. TURTLE MOUNTAIN
KEY PLAN
CALGARY & FISH CREEK R.D.A's.
1A
BOW
Elbow R.
SARCEE INDIAN RESERVE No 145
FISH Cr.
2
7
1
22
TURTLE MOUNTAIN R.D.A.
FRANK
BELLEVUE
CROWSNEST R.
12
3

LOCATIONS OF RESTRICTED DEVELOPMENT AREAS IN ALBERTA

Figure 2.13

Prepared by: Alberta Environment, Drafting Pool

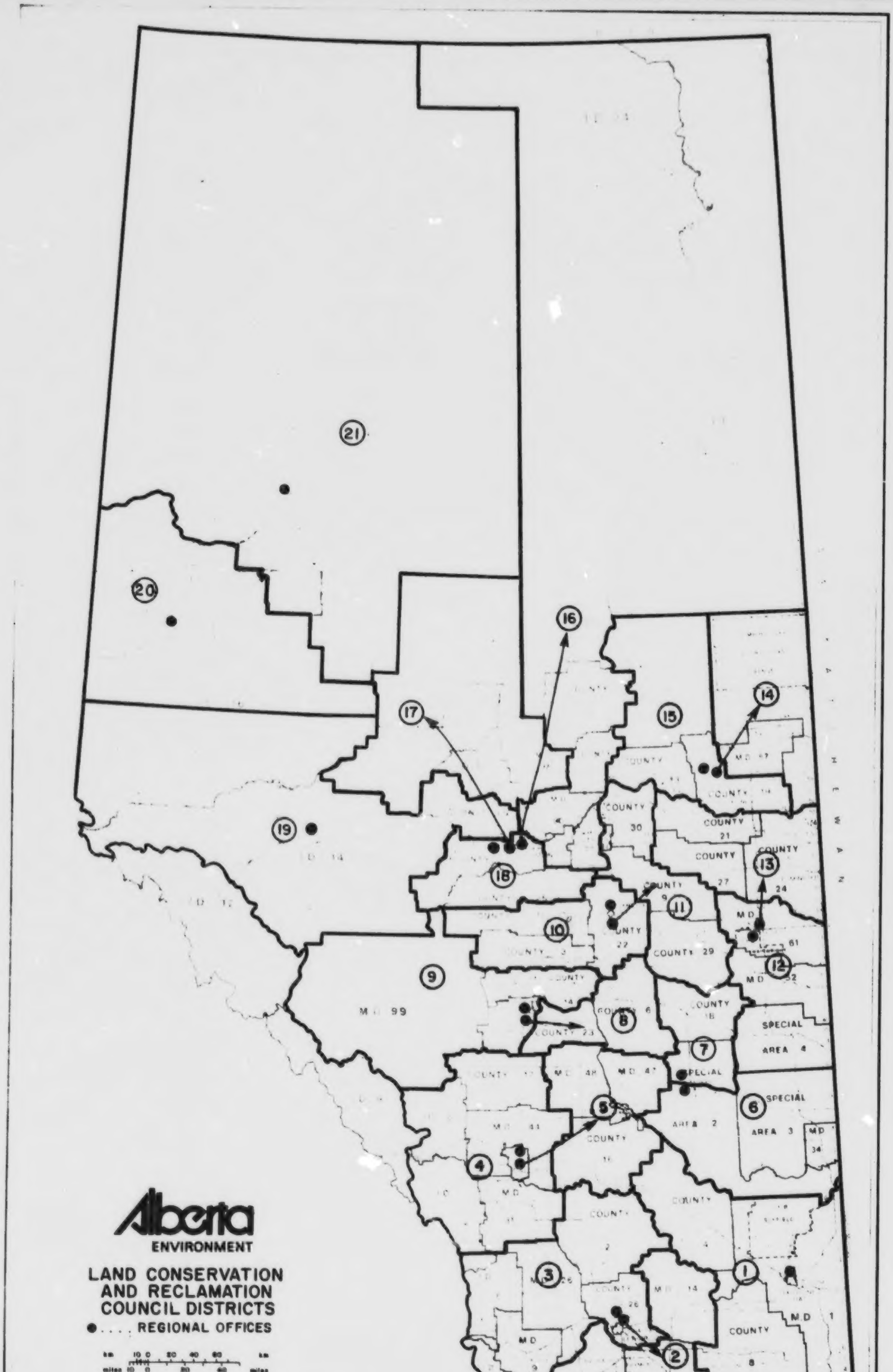

Alberta
ENVIRONMENT
LAND CONSERVATION
AND RECLAMATION
COUNCIL DISTRICTS
● . . . . REGIONAL OFFICES
km
miles
DEC , 1987
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
I.D. 14
M.D. 99
COUNTY 30
COUNTY 21
COUNTY 27
COUNTY 24
COUNTY 22
COUNTY 29
COUNTY 23
COUNTY 6
COUNTY 18
COUNTY 17
COUNTY 16
COUNTY 2
COUNTY 4
COUNTY 26
COUNTY 5
COUNTY 8
M.D. 48
M.D. 47
M.D. 44
M.D. 26
M.D. 14
M.D. 52
M.D. 61
M.D. 87
M.D. 34
M.D. 1
M.D. 6
M.D. 9
SPECIAL AREA 4
SPECIAL AREA 2
SPECIAL AREA 3
SASKATCHEWAN
MONTANA

Figure 2.14

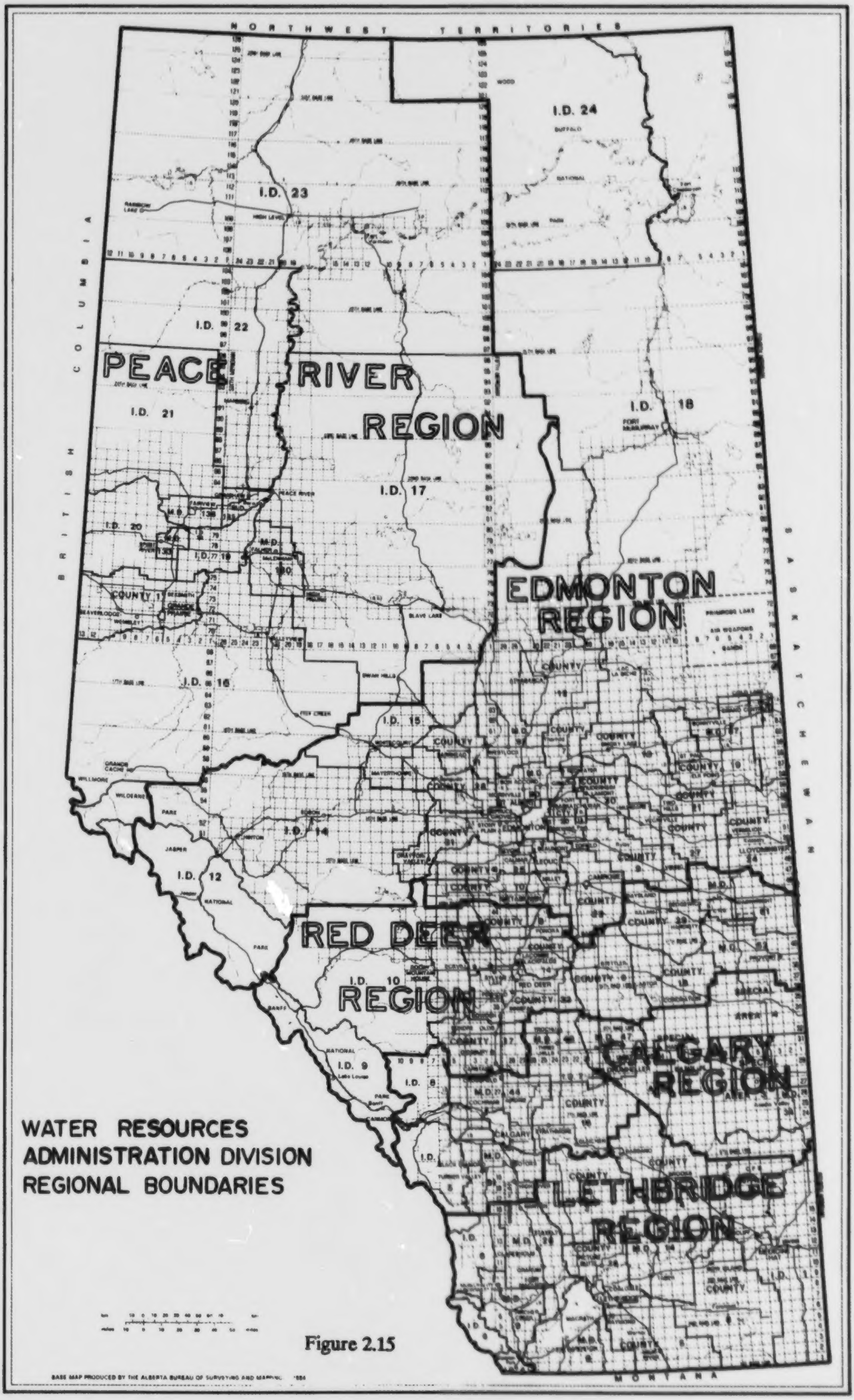

NORTHWEST TERRITORIES
BRITISH COLUMBIA
SASKATCHEWAN
MONTANA
I.D. 24
I.D. 23
I.D. 22
I.D. 21
I.D. 20
I.D. 18
I.D. 17
I.D. 16
I.D. 15
I.D. 14
I.D. 12
I.D. 10
I.D. 9
I.D. 8
PEACE RIVER REGION
EDMONTON REGION
RED DEER REGION
CALGARY REGION
LETHBRIDGE REGION
WATER RESOURCES
ADMINISTRATION DIVISION
REGIONAL BOUNDARIES

Figure 2.15

BASE MAP PRODUCED BY THE ALBERTA BUREAU OF SURVEYING AND MAPPING 1984

Section 3.0

TABLE OF CONTENTS

3.0 EXPLORATION: GEOPHYSICAL SURVEYS AND EVALUATION

3.1 Application Procedures
3.2 Jurisdictions, Permits and Approvals
3.3 Specific Environmental Guidelines
    3.3.1 Alignment and Access Width Considerations
    3.3.2 Cutting, Clearing and Timber Salvage
    3.3.3 Debris and Slash Disposal
    3.3.4 Terrain Stabilization
    3.3.5 Erosion Control
    3.3.6 Stream Crossings
    3.3.7 Wildlife and Habitat Protection
    3.3.8 Fuel Storage and Handling
    3.3.9 Use of Explosives
    3.3.10 Camps and Staging Areas
    3.3.11 Liquid and Solid Waste Disposal
    3.3.12 Reclamation for Abandonment

LIST OF TABLES

Number	Title
3.1	Environmental Concerns Directory
3.2	Minimum Allowable Distances for Non-Explosives, Explosives and Test Holes

LIST OF FIGURES

Number	Title
3.1	Application Procedures for Seismic and Mineral Exploration Activities
3.2a	Dog-Leg of New Seismic Line
3.2b	Surveyor's Line
3.3	Dykes Around Fuel Tanks

3.0 EXPLORATION: GEOPHYSICAL SURVEYS AND EVALUATION

Exploration refers to those activities of search and discovery (e.g. seismic surveys) for oil and gas deposits, but does not include exploratory drilling.

Table 3.1 is a quick reference which outlines environmental concerns, the location of information within this handbook and the regulatory contact for each envionmental concern.

3.1 APPLICATION PROCEDURES

All exploration activity in the province, with the exception of coal and oil sands, is legislated under the Exploration Regulation (see appendix A1). This includes geophysical (seismic) activity, quartz mineral exploration, and exploration for surface materials (sand and gravel). The exploration regulations are administred by Alberta Forestry Lands and Wildlife (AFLW).

The "one window" for all applications and approvals is the Forest Land Use Branch of the Alberta Forest Service, AFLW. As indicated in section 2.3, Crown land is divided into forested (Green Area) and non-forested (White Area) lands. The referral agency for the Green Area is also the Forest Land Use Branch. The referral agency for exploration on public lands within the White Area is the Land Management and Development Branch of the Public Lands Division, AFLW. Evaluation of programs and establishment of operating conditions are coordinated at the field level, and at the Edmonton head-office level for administrative purposes.

For the Green Area, the Forest Land Use Branch refers all programs to their field staff for site-specific inputs. If the referral process indicates a need for Fish and Wildlife input, the branch also refers programs directly to the Regional Habitat office of Fish and Wildlife, with notation that joint consultation between the Fish and Wildlife Division and the Alberta Forest Service field staff is required in prescribing operating conditions. Conditions are relayed back to the Forest Land Use Branch.

Legislation requires that the department has a maximum of ten working days to review and make decisions on applications. In cases where the department is unable to meet this turnaround time, due to extenuating circumstances, the company must be notified as to the reason for the delay and also as to when a decision is anticipated.

For the White Area, the Land Management and Development Branch evaluates each program and determines referrals necessary for their field staff. The program is submitted to the Fish and Wildlife Division if the referral criteria indicates such action. Coordinated operating conditions are forwarded by the Land Management and Development Branch and are incorporated in the approval.

In some cases, the Interdepartmental Exploration Review Committee may be asked to make recommendations for contentious programs in sensitive areas. The purpose of this committee is to review and make recommendations on exploration programs designated as Regulated Surface Operations.

In cases where the application is refused or the company feels the conditions being placed on their exploration approvals are unwarranted, it has the option to appeal the approval through the Exploration Appeals Committee. The Director of the Forest Land Use Branch is responsible for the Appeals Committee.

The procedure for appeals is as follows:

1. The applicant appeals in writing to the Chairman of the Exploration Appeals Committee
2. The committee acknowledges the appeal within 24 hours of receiving the appeal
3. The Committee meets to consider the appeal (field staff and appellant may be invited to participate)
4. The committee makes decisions and notifies the appellant in writing with a copy sent to Committee members and Assistant Deputy Ministers.

Table 3.1

SECTION 3.0 - EXPLORATION: GEOPHYSICAL SURVEYS AND EVALUATION

ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Alignment and Access Width Considerations	3.3.1	● Surface Rights (427-3570) ● See Appendix C for resource specialists from AFLW (See Appendix C for forest region or public land region field personnel from AFLW)
Cutting, Clearing and Timber Salvage	3.3.2	● Same as above
Debris and Slash Disposal	3.3.3	● Same as above
Terrain Stabilization	3.3.4,8.5	● Same as above
Erosion Control	3.3.5,8.5	● See Appendix C for Alberta Environment regional offices and Fish and Wildlife regional contacts
Stream Crossings	3.3.6,8.2	● See Appendix C for Alberta Environment regional office and Fish and Wildlife regional contacts
Wildlife and Habitat Protection	3.3.7,8.6,8.2	● See Appendix C for Fish and Wildlife regional contacts
Fuel Storage and Handling	3.3.8,8.6	● Same as above
Explosives	3.3.9,8.9	● Same as above
Camps and Staging Areas	3.3.10,8.6	● Same as above
Liquid and Solid Waste	3.3.11,8.7	● See Appendix C for forest region or public land region field personnel
Reclamation	3.3.12,8.4	● See Appendix C for Alberta Environment Land Conservation and Reclamation Division regarding private land. ● On Crown land contact regional forest or public lands offices of AFLW.

Figure 3.1 outlines the application procedure and the referral system. The jurisdictions of each of the referral departments are as follows:

1. The **Forest Land Use Branch** acts as the one window for all applications and coordinates the referral process. It is also responsible for all programs in the Green Area.
2. The **Land Management and Development Branch** is the one window reviewing authority for all programs affecting Crown land in the White Area. This branch coordinates the role of all departmental referrals for the White Areas of Crown land, and responds to the Forest Land Use Branch.
3. The **Forest Land Use Officer** reviews all programs in the Green Area and coordinates all conditions from the District Ranger and the Fish and Wildlife Officer. A response is then prepared for the Forest Land Use Branch. It is important that the proponent contact the Forest Land Use Officer prior to making application as this will facilitate the approval process.
4. The **Chief District Ranger** reviews all programs within his district, and responds with conditions to the Forest Land Use Officer. The proponent should also contact the Chief District Ranger prior to making the application.
5. The **District Public Lands Officer** reviews all programs for operating conditions in the White Areas of Crown land, and responds to the Land Management and Development Branch in Edmonton.
6. **Alberta Recreation and Parks** becomes involved with programs which are within a provincial park or in ecological reserves.
7. **Alberta Environment** becomes involved when the program includes lakes, watershed study areas where watershed surveys are underway, and all programs within 1 km of a dam.
8. **Alberta Culture** becomes involved with programs affecting existing or potential historic sites.
9. **Alberta Energy** reviews any program which relates to metallic minerals (Mineral Agreements Branch) and surface materials (Surface Land Use - Public Lands). This referral is for information purposes only.
10. **Alberta Municipal Affairs** reviews any program involving a Metis Settlement. This referral is for information only.
11. The **Grazing Reserve Manager** becomes involved with any programs which affect grazing areas.
12. **Regional Fish and Wildlife Habitat Staff** become involved with all programs affecting areas identified as key wildlife habitats for waterfowl or wildlife.
13. The **Natural Areas Committee** becomes involved if a program affects a natural area (ie. parcels of land set aside under reservation to conserve environmental diversity in the provinces' natural zones).

It should be noted that the Deputy Minister of AFLW reviews all programs which impact recreational lakes, programs which Alberta Forest Service has recommended for approval and programs which affect the Lubicon Lake Indian Band land claim.

Copy of a geophysical industry approval form for exploration companies is attached in Appendix D. The Exploration Regulation (see Appendix A1) outlines, in detail, the application procedures required to apply for an exploration approval. The application must include a preliminary plan of the project, the name, address, and licence number of the licensee who will conduct the exploration, and the name, address, and permit number of the permittee who will operate the exploration equipment.

Every application for an exploration approval will be subjected to the referral system. Upon completion of the exploration program, a final plan for the approved exploration program must be submitted.

3.2 JURISDICTIONS, PERMITS and APPROVALS

Alberta Forestry, Lands and Wildlife monitor exploration operations. As discussed above, the Forest Land Use Branch is responsible for Green Areas and the Land Management and Development Branch is responsible for White Areas of the province. For a map of the Green and White Areas, contact the Forest Land Use Branch (403) 427-3583.

Prior to undertaking an exploration program the following must be obtained:

1. Exploration Approval. This approval is required for the preliminary plan for exploration.
2. Exploration Licence. This licence is required to conduct exploration.
3. Exploration Permit. This permit is required to operate exploration equipment.

In addition there are a number of consents that are required:

1. On private land - consent of owner.
2. On Crown land - consent of appropriate government department.
3. On occupied public land - consent of holder or disposition to which lands are subject.

In any event, the proponent must obtain approval of the landowner and land user.

3.3 SPECIFIC ENVIRONMENTAL GUIDELINES

New guidelines are being prepared by Alberta Foresty Lands and Wildlife. It is expected that these guidelines will be available during the summer of 1988.

3.3.1 ALIGNMENT and ACCESS WIDTH CONSIDERATIONS

A useful reference document is "The Resource Handbook, Operational Guidelines for Industry". This document is available from the Information Center, AFLW, phone (403) 427-3590.

Typical requirements for access and alignment of seismic lines and access roads are as follows:

1. Existing roads should be used as much as possible to obtain access to a given site. This will avoid redundant road construction and minimize unnecessary encroachment on the adjacent land.
2. In high value or sensitive areas, it may be required to fence or post signs to limit the use of access roads. This should be determined in the planning stages and through contact with the appropriate government land management agency, e.g. Forest Officer or Public Lands Officer as discussed in Section 3.2.
3. The line of sight along new cut lines should not exceed 360m. The line of sight can be restricted by dog-legs spaced at 360m intervals unless the terrain accomplishes the same goal. A narrow hand cut line (1.5m in width) is permitted through the buffer zone to allow stringing of geophones. Wherever the proposed seismic line crosses or meets a point of access (e.g. road, trail, right-of-way or other line being used for access), the line is to be dog-legged and closed if approved by the Local Forest Officer. The closure should be accomplished by putting logs, stumps, or slash back over the length of the dog-leg (see Figure 3.2a).
4. Secondary road access should be dog-legged to eliminate continuous sight down the line. Only hand cutting is permitted within 30m of the road right-of-way edge to facilitate surveying and cable layout (see Figure 3.2b).
5. The proponent should contact the Forest Officer or Public Lands Officer to determine the minimal allowable distance between cut lines.
6. For stream crossing considerations, see Section 3.3.6.

7. Conventional dozer line cuts are to have a maximum width of 8m unless otherwise specifically approved in writing by the Forest Officer.
8. All handcut lines used for detours are to have a maximum width of 3m unless otherwise authorized in writing by the Forest Officer.
9. Lines cut for helicopter-assisted portable operations are to have a maximum width of 2.5m unless otherwise authorized in writing by the Forest Officer.
10. All significant deviations from the approved line for detours or additional shot holes must have prior approval by the Forest Officer.
11. No more than a single detour may be constructed to gain access around any slope or across any watercourse.
12. In terrain where gradients are severe enough to warrant a detour for vehicular movement, the seismic line must be handcut to a maximum width of 3m.
13. Except for crossings, no seismic line may be constructed closer than 45m from the banks of any watercourse or lake.
14. Cutting of alternate or parallel seismic lines to compensate for errors made in the original line clearing will not be allowed by AFLW and will be treated as trespassing.
15. Line cutting must terminate 1000m from Federal, Provincial and Municipal Park boundaries. Hand cutting is allowed within this buffer zone to a distance of 50m from the Park boundaries. The buffer zone must be maintained even in areas where the area is already cleared.
16. "Push-outs" or "Turn-arounds" should be discussed and approved by the local Forest Officer.
17. No travelled trail should be obstructed.
18. Be aware of registered trap lines and avoid them wherever possible (contact the Fish and Wildlife Branch of AFLW). The trapper should be notified by registered letter at least 5 days before activity occurs in his area.

3.3.2 CUTTING, CLEARING AND TIMBER SALVAGE

Cutting, clearing and timber salvage should be undertaken as per the regulations.

Information available on the regulations for exploration lines and access routes includes:

1. **The Forest and Prairie Protection Regulations** (Refer to Appendix A1)
2. **Timber Management Regulations** Sections 146 to 153 (Refer to Appendix A1)
3. **The Resource Handbook, Operational Guidelines For Industry**

   Information: Outlines specific guidelines as they relate to timber salvage as the result of exploration practices.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.
4. **Northeast Region Geophysical Operating Guidelines**

   Information: Handbook of operating guidelines for AFLW's Northeast Region.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.
5. **Eastern Slopes Region Geoghysical Operating Guidelines - Working Paper**

   Information: Handbook of operating guidelines for AFLW's Eastern Slopes Region.

   Available: Information Center, AFLW
   phone: (403) 427-3590.

3.3.3 DEBRIS AND SLASH DISPOSAL

Debris and slash must be disposed of to reduce fire hazard, avoid compromising future uses of the site, maintain aesthetic quality and aid in revegetation and reclamation. Usually debris is windrowed away from standing cover in windrows or piles not exceeding 60m in length and separated by 8m firebreaks. If burning occurs on Crown land, a burning permit will be required from AFLW (see Table 2.3 and Appendix D).

Information available on debris and slash disposal can be obtained from:

1. **The Resource Handbook, Operational Guidelines For Industry**

   Information: Outlines specific guidelines as they relate to debris disposal as the result of exploration practices.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.

2. **Resource Road Planning Guidelines**

   Information: Booklet provides guidelines on road construction, debris disposal and road planning for access road developments in the Green Area of Alberta.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.

3. **Guidelines for the Reclamation of Linear Disturbances**

   Information: Provides production and operation personnel with reclamation techniques for seismic lines, pipelines or roadways.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

3.3.4 TERRAIN STABILIZATION

Terrain stabilization techniques are determined by the type of soil, overburden materials and the local relief in the area where the line cutting will occur. Techniques available for terrain stabilization as well as construction guidelines for varying slopes and soil materials are discussed in Section 8.5. Terrain stabilization can also include spreading of slash material and debris along the seismic line, planting of vegetation and the use of mulches. These techniques are discussed in Section 8.4.

Information available on Terrain Stabilization includes:

1. **Guidelines For The Reclamation of Linear Disturbances**

   Information: Guide for assessing different erosion and stabilization practices.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

3.3.5 EROSION CONTROL

Control of erosion and the potential pollution arising from erosion in the Green Area is regulated under The Forest and Prairie Protection Regulations. The regulations are primarily concerned with the rate of erosion in relation to precipitation, topography and vegetation cover.

Erosion control techniques for most situations are discussed in Section 8.5. Specific guidelines relative to exploration activities include:

1. When exploration work is being carried out in the Green Area of Alberta, the Forest Officer for the region should be contacted to ascertain specific erosion control measures for the area. A list of Forest Officers and regions is provided in Appendix C - Contacts.
2. Where any operations are conducted in a forest, the person conducting the operations should:
   a) remove or remedy any interference with the normal drainage of water from land, where such interference has been caused by the operation

b) remove, without causing channel damage, any obstruction to the natural flow of water in any stream channel or watercourse, whether temporary or permanent, where the obstruction has been caused by the operations

c) prevent soil erosion, sedimentation of streams or reduction in watershed capacity caused by the removal of trees, shrubs and other vegetation, disturbance of land surface, or any other cause resulting from the operations. A growth of vegetation sufficient to prevent accelerated erosion should be re-established and maintained on all bare soil areas unless otherwise approved by the Assistant Deputy Minister.

3. During all track-mounted vehicle-assisted operations, every precaution should be taken to minimize disturbance to the topsoil.
4. As soon as reasonably possible, the seismic lines should be contoured to their original condition, debris should be spread over the line and walked over if permitted, and the line should be reseeded and fertilized if necessary.

Information available on Erosion Control includes (also refer to Section 8.5):

1. **Guidelines For The Reclamation of Linear Disturbances**

   Information: Document outlines various techniques for the control and prevention of erosion problems.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721

2. **Habitat Enhancement And The Petroleum Industry**

   Information: Document outlines different enhancement techniques which also impact erosion control related to drilling, road construction and transmission lines.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

3. **Resource Road Planning Guidelines**

   Information: Document outlines road planning and design enhancement techniques. Guidelines relate to development in the Green Area.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.

4. **The Resource Handbook, Operational Guidelines for Industry**

   Information: Primarily concerned with the effects of water on soil removal. Document outlines guidelines pertaining to erosion control.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.

5. **Erosion Potential Index - A Method for Evaluating Sheet Erosion at Stream Crossings**

   Information: Manual provides a structured method of evaluating stream crossings to reduce sediment entering streams and maximizing resources for reclamation.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.

3.3.6 STREAM CROSSINGS

Exploration activities can have an impact on water quality by adding sediment to the stream and by physically altering the stream banks. Specific procedures to reduce the impact of such activities are given in Section 8.2. Additional environmental operating guidelines applicable to exploration activities are as follows:

1. Not more than one crossing should be constructed at the intersection of a seismic line and any stream.
2. Seismic lines should cross at right angles to the stream.

3. Debris and soil materials should be pulled back at a crossing rather than pushed through the stream. Wood and soil materials should not be placed into any waters.
4. The number of vehicular movements across a stream crossing should be kept to a minimum.
5. Depending upon the terrain, vehicles and accessories designed to reduce potential erosion cuts should be used (i.e. wide pads and flotation tires).
6. Stream crossing intervals should not be within 2 km (stream length) of each other or at the discretion of the District Forest Officer.
7. Winter stream crossings are preferred and should be constructed of snow and ice only. Such construction is acceptable on any stream when snow and ice materials are readily available (see Figure 8.2.2).
8. Portable bridges may be required on some streams (e.g. greater than 12m wide) (see Figure 8.2.1). Fords may be acceptable in shallow streams identified by the Regional Habitat staff at the time of application (see Figure 8.2.3).
9. Log fills are acceptable in streams which have abrupt banks (see Figure 8.2.4). Logs should have their roots, branches, and tops removed. Logs should be removed prior to spring break-up. The use of bottom cables during construction may help to remove the logs. Streams which have surface winter flows should be avoided to prevent freezing of logs which would make removal difficult.
10. Seismic trails should not be closer than 45m to the banks of any watercourse, except at crossings.
11. On some streams, extensive reclamation to the stream banks may be required. This may include the reconstruction of banks with one of the alternatives discussed in Section 8.2 (see Figure 8.2.10).

Information available on stream crossings includes:

1. **Stream Crossing Guidelines, Operational Guidelines for Industry**

   Information: Document provides environmental protection practices for the planning, construction, maintenance and abandonment of stream crossings on Crown land.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.

2. **Environmental Handbook for Pipeline Construction**

   Information: Section within handbook deals with environmental impacts at water crossings.

   Available: Alberta Environment Library
   phone: (403) 427-5870.

3.3.7 WILDLIFE AND HABITAT PROTECTION

Many of the environmental operating guidelines identified in Section 3.3 are based on minimizing the impact on wildlife and habitat. Additional guidelines relative to this aspect are:

1. Programs should be run in sequence rather than concurrently, depending upon the time of year and number of programs.
2. Timing is an important concern. Timing will change depending on the wildlife impacted. For example; May 1 to June 30 should be avoided for waterfowl and December 1 to May 1 should be avoided for wintering ungulates. Specific timing constraints may be imposed by Regional Habitat staff.

Information available on wildlife and habitat protection includes:

1. **Habitat Enhancement and The Petroleum Industry**

   Information: Document outlines various habitat enhancement techniques, gives information on current practices and suggests techniques to avoid problems.

Available: Canadian Petroleum Association
phone: (403) 269-6721
or
Fish and Wildlife Division, AFLW
phone: (403) 427-6734.

2. **Fisheries Habitat Protection Guidelines**

   Information: Document outlines problems that arise from petroleum related exploration and suggests techniques to avoid problems.

   Available: Fish and Wildlife Division, AFLW
   phone: (403) 427-6734.

3.3.8 FUEL STORAGE AND HANDLING

For regulations pertaining to fuel storage see the Oil and Gas Conservation Act, Regulation 151/71.

Specific guidelines for fuel storage and handling are as follows:

1. All personnel should be instructed in fuel handling procedures.
2. Fuel containers should be situated 100m from the high water mark of any water body so that spillage or leakage will not reach the water.
3. Fuel tanks are preferable to bladders, and welded steel tanks are preferable to bolted ones.
4. Fuel storage areas should be clearly marked or barricaded to ensure that they are not damaged by moving vehicles. The markers should be visible under adverse weather conditions. Smoking should not be permitted within 10m of the fuel storage area. International "no smoking" signs should be posted.
5. Dykes should be built around fuel tanks to contain accidental spills and leakages (see Figure 3.3). Provision should be made in the containment area to drain uncontaminated rain or snow melt water. Provision should also be incorporated into the design to drain the containment area inside the dyked area into an impermeable pit or tank if required for spill cleanup. The containment area should not be located in a drainage channel and should have ditches constructed to divert any water around the area.
6. Fuel spills should be reported to the land owner or land management agency responsible for the area. In all cases, Alberta Environment should be contacted at their regional office (see Appendix C - Contacts).
7. Proper electrical grounding should be provided for all fuel storage containers as well as for loading and off-loading equipment.

3.3.9 USE OF EXPLOSIVES

Specific environmental operating guidelines and regulations for the use and detonation of explosives are listed below:

1. The care and handling of explosives must conform to the specifications established by the Explosives Division, Department of Energy, Mines and Resources, Government of Canada and the Explosives Safety Regulations of the Occupational Health and Safety Act.
2. Where a charge is detonated in the vicinity of a water well, care should be taken to avoid damage to the well. Drill sites should therefore be at a sufficient distance from the well. All setback requirements are defined in the Exploration Regulation (AR 423/78).
3. Shot holes found to be flowing when drilled should not be loaded or shot. All flowing shot holes should be filled to permanently and effectively stop the flow. Any swamp or marsh area in a topographically low area should be considered a potential flowing zone. The Groundwater Answering Service of Alberta Environment (phone 403-427-2770) can provide information on flowing zones within the Province.
4. Shot holes should be filled with drill cuttings and capped near the surface to prevent surface cratering and animal injury.

5. Minimum allowable distances for shot holes, linear explosives and non-explosives vibrators are given in Table 3.2 (AR 423/78).
6. Surface charges should not be detonated closer than 15m from a water body.
7. Subsurface charges should not be detonated closer than 45m from a water body.
8. Cratered holes must be plugged and filled to the original ground contour before progressing to the next shot hole, or as soon as conditions permit.
9. Explosives must not be used in waters frequented by fish unless specific conditions will be identified in the approval letter.
10. High flash primacord must not be used during high fire hazard conditions.
11. Protective blankets should be used when explosives are being used in close proximity to buildings, equipment, etc.

Information available on the use of explosives includes:

1. **Rules for the Storage and Transportation of Explosives by the Seismic Industry.**

   Information: Document outlines safe practices for licencing, storage, dispensing, transporting and receiving explosives.

   Available: Explosives Branch, Energy, Mines and Resources Canada
   phone: (403) 292-4766.

2. **Blasting Explosives: A Guide to Safety**

   Information: Includes instructions on blasting stumps, ditching, blockholing and mudcapping.

   Available: Explosives Branch, Energy, Mines and Resources Canada
   phone: (403) 292-4766.

3. **Blasting Explosives and Detonators**

   Information: Includes storage, possession, transportation, destruction and sale of explosives.

   Available: Explosives Branch, Energy, Mines and Resources Canada
   phone: (403) 292-4766.

TABLE 3.2
MINIMUM ALLOWABLE DISTANCES FOR NON-EXPLOSIVES, EXPLOSIVES AND TEST HOLES

	Non-explosive	Explosive		Test Hole
	Distance (metres)	Charge Weight (kilograms)	Distance (metres)	Distance (metres)
Residence, barn, cemetery and a building or structure with a concrete base	50	all	180	100
Water Well	100(Vibroseis) 50(other than Vibroseis)	all	180	180
Driveway, gateway or buried water pipeline	5	all	10	10
Survey monument or buried telephone or telecommunication line	1	all	1	1
Oil or gas pipeline (measure from centre line of the pipeline) and an oil or gas well	15	≤2	32	32
		>2 ≤4	45	
		>4 ≤6	55	
		>6 ≤8	64	
		>8 ≤10	101	
		>10≤20	143	
		>20≤40	180	
		>40		

Note:
* In this schedule, "oil or gas pipeline" means pipeline for the transmission of oil or gas and having a maximum operating pressure of 690 kiloPascals or greater.
Alberta Regulation 423/78.

3.3.10 CAMPS AND STAGING AREAS

The primary considerations for camps and staging areas are given in Section 8.6. Specific guidelines related to exploration activities are listed below:

1. Seismic camps should be moved as often as practical (e.g. daily) to minimize traffic distances and also to minimize the amount of garbage and waste to be disposed at any one location.
2. Sites should be selected such that several operations can be served from each staging area.
3. Personnel should be advised that wildlife should not be harrassed and personnel should assume the responsibility to minimize pollution and destruction of the natural environment.
4. Positioning of campsites can be very important. Mineral lick areas, denning sites and nesting sites should be avoided. The regional Forest Officer should be consulted (see Appendix C - Contacts) for the selection of camp sites.

3.3.11 LIQUID AND SOLID WASTE DISPOSAL

Guidelines for liquid and solid waste disposal particular to campsites are discussed in detail in Section 8.6. Information available on liquid and solid waste disposal includes:

1. **The Resource Handbook, Operational Guidelines For Industry**
   Information: The handbook assists industry in planning their initial and on-going activities as they relate to petroleum exploration and development.
   Available: Information Centre, AFLW
   phone: (403) 427-3590.
2. **Sask-Alta Waste Disposal Cooperative - Waste Disposal Guidelines**
   Information: Provides insight into the methods and associated government regulations regarding the disposal of wastes from production facilities.
   Available: Husky Oil Operations Ltd.
   phone: (403) 825-1196.

3.3.12 RECLAMATION FOR ABANDONMENT

Shot holes shall be abandoned and plugged immediately after detonation.

Prior to requesting a Reclamation Order and Certificate, the surface disturbance is to be reclaimed as close as possible to its original conditions. In addition, the following shall be satisfied:

1. slope contours restored
2. topsoil replaced and recontoured
3. establishment of a self-sustaining vegetation cover consistent with original setting
4. no erosion problems.

Details on reclamation can be found in secton 8.4. Specific information sources on reclamation are as follows:

1. **Guidelines for the Reclamation of Linear Disturbances**
   Information: Provides industry personnel with reclamation techniques for seismic lines, pipelines or roadways.
   Available: Canadian Petroleum Association
   phone: (403) 269-6721.
2. **The Resource Handbook, Operational Guidelines For Industry**
   Information: Specific guidelines for the reclamation of major and minor disturbances on forest lands.
   Available: Information Centre, AFLW
   phone: (403) 427-3590.
3. **Guidelines For The Reclamation of Land in Alberta**
   Information: The Land Conservation and Reclamation Council's criteria are outlined as they relate to the application for approval of surface disturbances and the reclamation of lands.
   Available: Land Conservation and Reclamation Council, Alberta Environment
   phone: (403) 427-6212.
4. **Forest Growth and Revegetation Along Seismic Lines**
   Information: Study outlines forest growth and revegetation on and adjacent to seismic lines. A detailed description of tree growth studies is also included.
   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

Application Preparation

Prepare map showing seimic lines including specifications (e.g. shot point distances, charge sizes, etc.)

Define which areas the line crosses (e.g. Green, White if on Crown land and landowners if on Patented land)

Prepare letters of application which should include the following:

- — applicant's name
- — location of seismic line
- — contractor's name
- — length of line
- — commencement date
- — completion date
- — access
- — minerals being explored
- — portions on road allowance
- — portions on private land
- — if in Green area give:
  - — forest
  - — district
  - — FMA
  - —Eastern Slopes Region
- — If inWhite Area:
  - — supervisory district

Identify
- — Pipeline Crossings
- — Road Ownership
- — Traplines
- — Railroad Crossings
- — Stream Locations

Prepare IEI

Application Submission

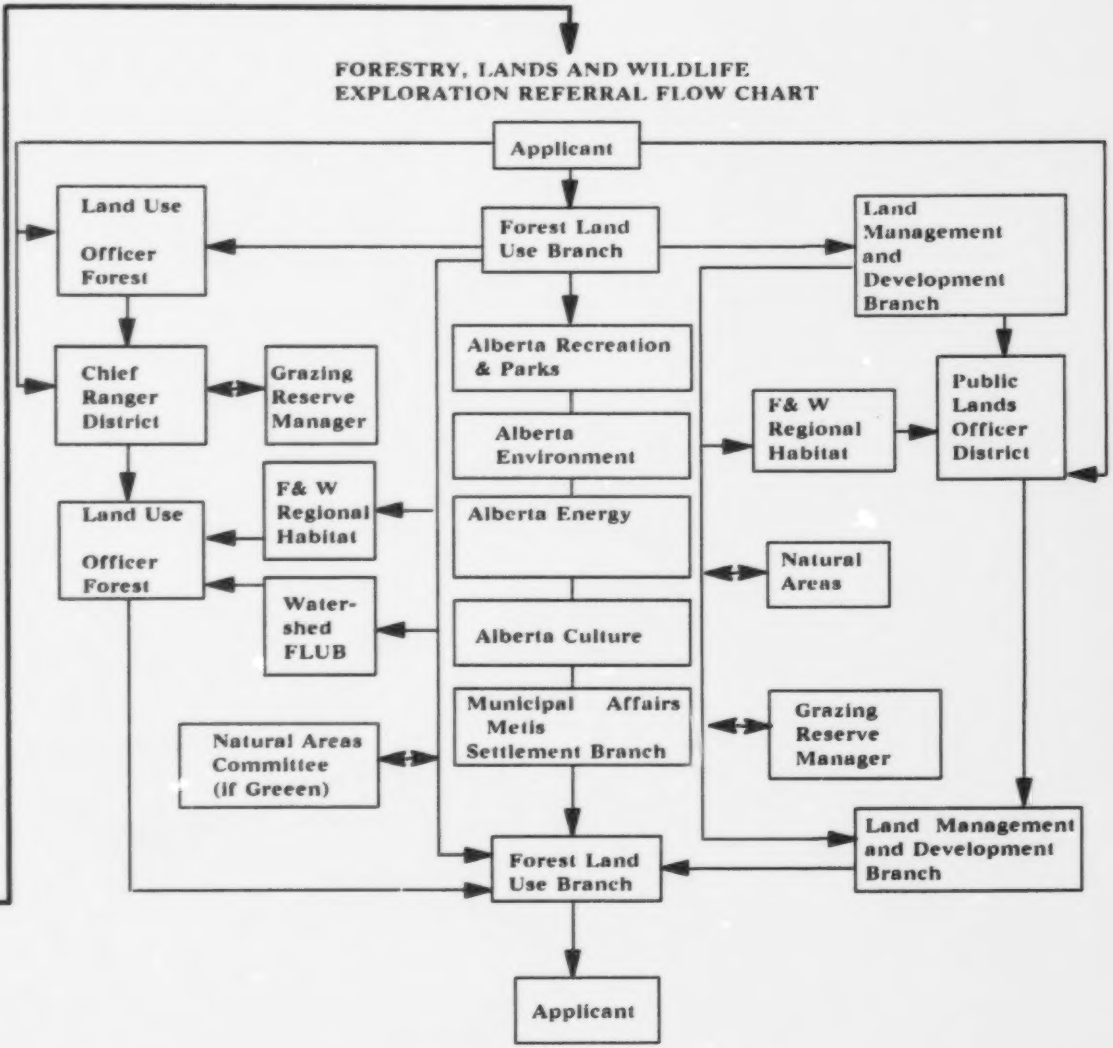

FORESTRY, LANDS AND WILDLIFE EXPLORATION REFERRAL FLOW CHART
Applicant
Forest Land Use Branch
Land Use Officer Forest
Chief Ranger District
Grazing Reserve Manager
F& W Regional Habitat
Land Use Officer Forest
Water-shed FLUB
Natural Areas Committee (if Greeen)
Alberta Recreation & Parks
Alberta Environment
Alberta Energy
Alberta Culture
Municipal Affairs Metis Settlement Branch
Land Management and Development Branch
F& W Regional Habitat
Public Lands Officer District
Natural Areas
Grazing Reserve Manager
Land Management and Development Branch
Forest Land Use Branch
Applicant

Figure 3.1

SEISMIC or MINERAL EXPLORATION ACTIVITIES
APPLICATION PROCEDURES
(Reference: David Bromley Engineering (1983) Ltd..)

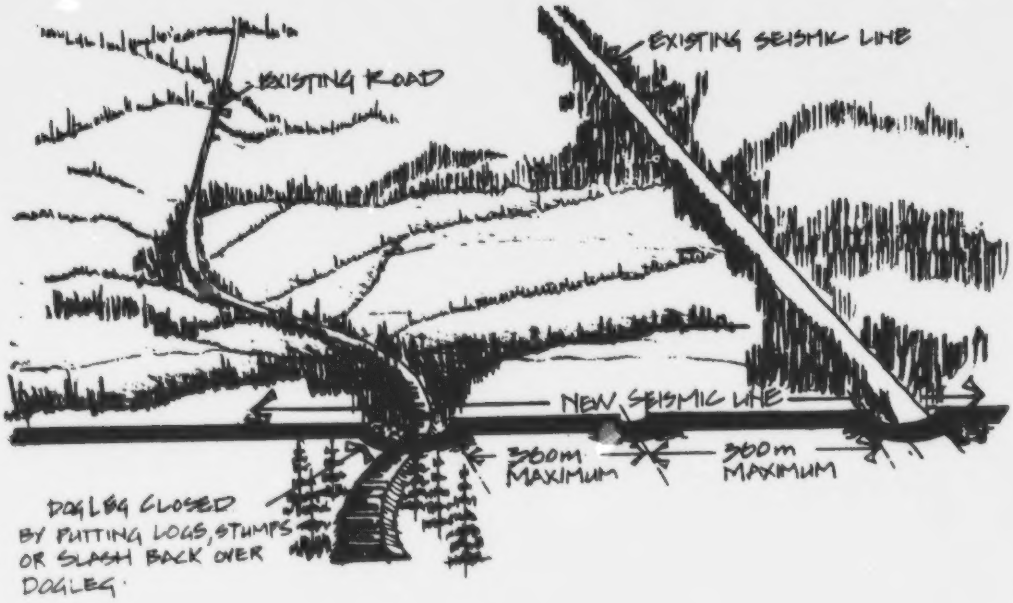

EXISTING ROAD
EXISTING SEISMIC LINE
NEW SEISMIC LINE
300m MAXIMUM
300m MAXIMUM
DOGLEG CLOSED BY PUTTING LOGS, STUMPS OR SLASH BACK OVER DOGLEG.

Figure 3.2 (a) DOGLEG OF NEW SEISMIC LINE

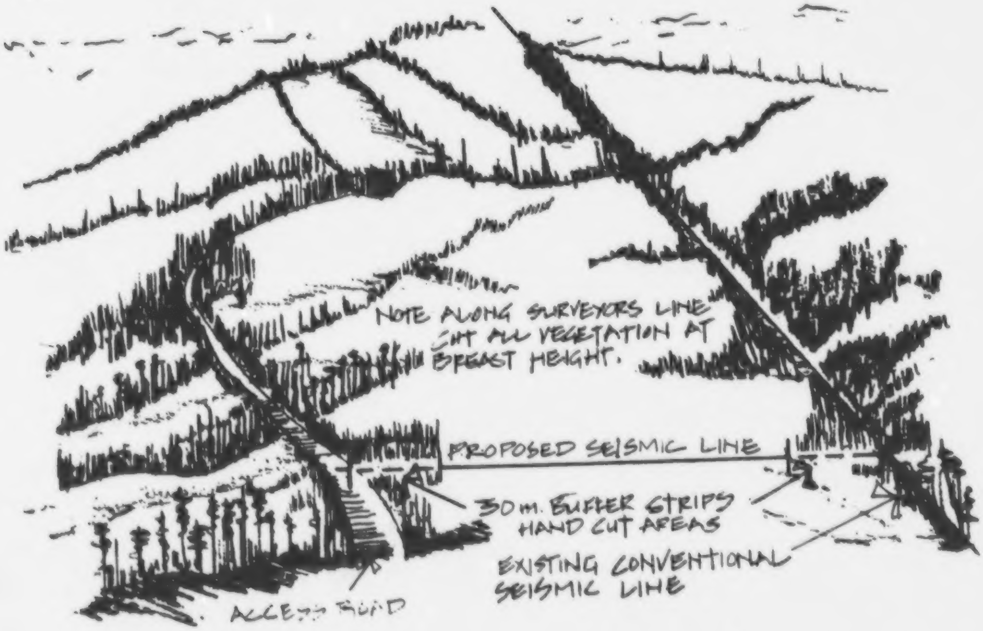

NOTE ALONG SURVEYORS LINE CUT ALL VEGETATION AT BREAST HEIGHT.
PROPOSED SEISMIC LINE
30m. BUFFER STRIPS HAND CUT AREAS
EXISTING CONVENTIONAL SEISMIC LINE
ACCESS ROAD

Figure 3.2 (b) SURVEYOR'S LINE

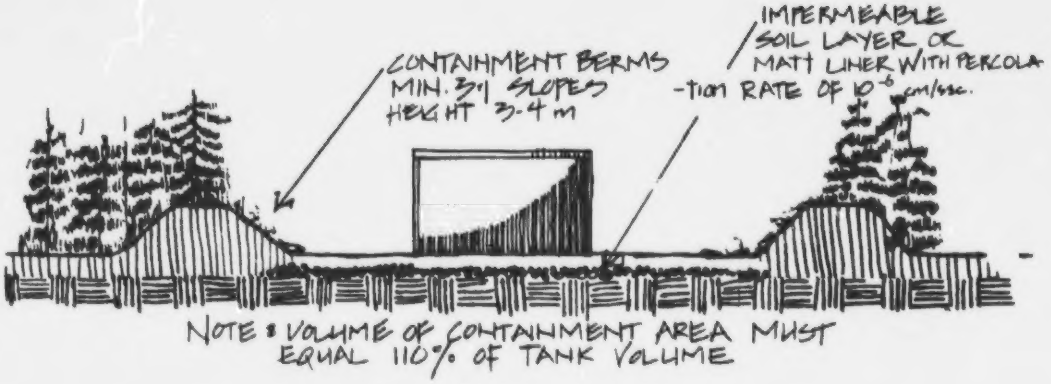

CONTAINMENT BERMS
MIN. 3:1 SLOPES
HEIGHT 3-4 m
IMPERMEABLE
SOIL LAYER OR
MATT LINER WITH PERCOLA-
-TION RATE OF 10^{-6} cm/sec.
NOTE: VOLUME OF CONTAINMENT AREA MUST
EQUAL 110% OF TANK VOLUME

Figure 3.3 DYKES AROUND FUEL TANKS

Section 4.0

TABLE OF CONTENTS

4.0 DRILLING: EXPLORATION AND DEVELOPMENT

- 4.1 Application Procedures
- 4.2 Jurisdictions, Permits and Approvals
- 4.3 Specific Environmental Guidelines
  - 4.3.1 Selection of Drilling Site
  - 4.3.2 Clearing, Timber Salvage and Debris Disposal
  - 4.3.3 Fuel Storage and Handling
  - 4.3.4 Waste Disposal
  - 4.3.5 Disposal of Waste Drilling Fluids and Solids
  - 4.3.6 Wildlife, Fisheries and Habitat Protection
  - 4.3.7 Terrain Stabilization
  - 4.3.8 Protection of Freshwater Horizons and Mineral Deposits
  - 4.3.9 Blowout Prevention Plan
  - 4.3.10 Flaring During Completion and Testing of Gas and Oil Wells
  - 4.3.11 Well Abandonment
  - 4.3.12 Rig Dismantling and Site Completion
  - 4.3.13 Reclamation
  - 4.3.14 Noise Control

LIST OF TABLES

Number	Title
4.1	Environmental Concerns Directory

LIST OF FIGURES

Number	Title
4.1	Well Drilling Application Procedure
4.2	Typical Lease Layout
4.3	Recirculating Sump
4.4	Shallow Hole Recirculating Sump
4.5	Non-Recirculating Sump
4.6	Recirculating Sump - Alternative Layout
4.7a	Prevention Against Groundwater Contamination
4.7b	Cross-Section of a Lease on Sloping Ground
4.8	Environmental Control at a Gas Well Installation
4.9	Environmental Conrol at a Well
4.10	Environmental Control at a Drilling Rig

4.0 DRILLING: EXPLORATION AND DEVELOPMENT

This section addresses only activities related to exploratory and production drilling.

Table 4.1 is a quick reference which outlines environmental concerns, the location of information within this handbook and the regulatory contact for each environmental concern.

The ERCB has prepared a number of informational letters (IL) and interim directives (ID) on environmental and regulatory concerns related to drilling operations. These documents are as follows:

IL 83-3	Oilfield Solution – Gas Conservation: Flaring Limit Review
IL 83-10	Disposal of Oil Field Waste
IL 84-1	Casing Cementing – Minimum Requirements ERCB Guide G-9 Revision
IL 84-12	Surface Casing and Legging Requirements-New Disposal and Injection Wells
IL 85-3	Operational Use of Flare Guns in Forested Public Lands
IL 85-15	Sour Gas Wells
IL 85-16	Storage, Handling, and Disposal of Oily Wastes
ID OG 75-2	Sump Fluid Disposal Requirements
ID 80-2	Noise Control Guidelines
ID 81-1	Subsurface Disposal of Drilling Fluids
ID 81-4	Proposed Wells and Pipelines Near Urban Centres
ID 85-4	Zama Lake Area: Special Requirements Regarding Waterfowl Migration
ID 87-2	Sour Well Licensing and Drilling Requirements.

ERCB ENERFAX Factsheet No. 6 - All About Critical Wells.

4.1 APPLICATION PROCEDURES

The selection, design, construction and operation of a drilling site are controlled under The Oil and Gas Conservation Act and regulations, and The Mines and Minerals Act, Exploration Regulation (AR 423/78). Parts of the Acts and regulations are reproduced in Appendix A1 of this handbook. Under these Acts and regulations, formal application must be made to the Energy Resources Conservation Board for a well licence. Surface Rights must be secured from the particular landowner in question and evidence that surface rights have been obtained should be submitted with the well licence application. The application procedure is shown in Figure 4.1.

4.2 JURISDICTIONS, PERMITS AND APPROVALS

The responsibilities of government departments for petroleum industry applications are outlined in Section 2.1. Examples of the permits, licences and approvals can be found in Appendix D.

Prior to any formal application the proponent should discuss the proposed activities with the particular landowner, whether it is the appropriate government representative for public lands or the private landowner for patented lands.

For a listing of potential permits refer to Table 2.1.

For more information on permits and approvals for drilling operations contact the:

Energy Resources Conservation Board
phone (403) 297-8311.

TABLE 4.1

SECTION 4.0 DRILLING: EXPLORATIONS AND DEVELOPMENT ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Site Selection	4.3.1	• Surface Rights (427–3570) • See Appendix C for resource specialists of AFLW • See Appendix C for Forest or Public Lands regional field personnel of AFLW • On patented land see the property owner
Cutting, Clearing, Timber Salvage and Debris Disposal	4.3.2	• Same as above
Fuel Storage and Handling	4.3.3	• For Crown lands same as above. • On patented land, ERCB regional office (See Apendix C for ERCB regional office telephone numbers)
Spills	8.4.3	• Same as above
Waste	4.3.4, 8.6, 8.7	• Same as above and Alberta Environment (427–5868)
Contingency Plans and Blowout Prevention	4.3.9, 8.9	• ERCB (297–8311) • See Appendix C for regional offices of the ERCB
Disposal of Drilling Fluids and solids	4.3.5	• Same as above
Wildlife, Fisheries and Habitat Protection	4.3.6, 8.1, 8.2	• See Appendix C for Fish and Wildlife regional offices
Erosion and Terrain Stabilization	4.3.7, 8.5	• On Crown land, see Appendix C for Forest and Public Land regional field personnel of AFLW • For patented land see Appendix C for ERCB regional field personnel
Freshwater Horizons, Aquifers and Mineral Deposits	4.3.8, 8.7.1	• Alberta Environment – Ground Water Protection Branch (427–6190) • Water Resources Ground Water (427–6241) Surface Water (427–7054)

TABLE 4.1 (Continued)

Flaring and Testing of Wells	4.3.10	• See Appendix C for ERCB regional field personnel
Abandonment	4.3.11, 8.10	• Same as above
Rig Dismantling and Completion	4.3.12, 8.10	• Same as above
Reclamation	4.3.13, 8.4	• Alberta Environment Reclamation (427-6323) • Reclamation Council (See Appendix C for regional offices)
Noise	4.3.14, 8.8	• ERCB (297-8311)
Access Roads	8.1	• Municipal juridsiction • Alberta Transportation (See Appendix C for regional offices) • Existing road owner, or if on Crown Land contact Forest or Public Lands Officer (see Appendix C for regional field offices of AFLW)

4.3 SPECIFIC ENVIRONMENTAL GUIDELINES

4.3.1 SELECTION OF DRILLING SITE

Well locations are chosen according to the target spacing units as set forth by the Energy Resources Conservation Board. Prior to selection of the drilling site and access road, a company representative should inspect the area together with the landowner or management agency responsible as discussed in Section 2.10.

Contact names for each region in Alberta are provided in Appendix C. Land-use maps, terrain sensitivity maps, photomosaics (where applicable) and wildlife maps should be consulted to identify vulnerable or sensitive areas which should be avoided.

When staking the drilling site, the following factors should be considered:

1. ERCB regulations regarding spacing unit patterns. If the well site location might have an adverse effect on the environment, and another location conforming to the target spacing is available, the matter should be brought to the attention of the ERCB. Generally, the ERCB regulations regarding spacing unit patterns and target areas identify corner target areas per quarter section. Refer also to ERCB Order Numbers SU 1088 and SU 800;
2. potential environmental effects of the proposed site for drilling and production operations and possible alternate sites available within the tolerances of the proposed well;
3. effect of the proposed operation on public health and safety;
4. the drainage pattern around the proposed drilling site. The site should be selected such that spills can be easily contained and where heavy vehicles can have ready access. This guideline also applies for staging areas, camps, fuel dumps and storage areas;
5. depth and type of topsoil: stripping and reclamation requirements;
6. potential for contamination to both surface and subsurface environments;
7. location of waste and drilling mud storage berms so that levees and sumps can be built to impound any deleterious liquids resulting from the drilling operations;
8. unnecessary removal of trees or alteration of other natural features;
9. location of campsites and access roads (see Sections 3.3.10, 8.6 and 8.1);
10. spacing requirements in residential areas for sour gas wells (see Table 5.3);
11. land-use restrictions (i.e. airports, proximity to dwellings). A well cannot be drilled within 1.5 km of the corporate limits of any city, town or village without approval from the municipality (see ERCB ID 81-4);
12. possible environmental effects on permafrost, marshes, river beds, fractured formations, springs, coal strata, etc.;
13. well sites should be constructed with a minimum of 100m of undisturbed vegetation left intact between the lease site and any watercourse or fish bearing water body;
14. approval from Alberta Transportation is required if the well site is within 100m of an existing right-of-way.
15. contact with the Improvement District, Municipality, County or landowner for site-specific requirements (see appendix A2).

Figure 4.2 displays proper equipment spacing standards.

4.3.2 CLEARING, TIMBER SALVAGE AND DEBRIS DISPOSAL (also see Section 3.3.2 and 3.3.3)

All drilling activities should employ methods which will result in the least environmental damage and the least forest growth removed.

The Forest and Prairie Protection Regulations and the Timber Management Regulations stipulate the requirements for cutting, clearing and timber salvage.

Information available on clearing, timber salvage and debris disposal includes:

1. **Guidelines For The Reclamation of Linear Disturbances**

   Information: Document outlines various guidelines relating to debris disposal as a result of seismic line and right-of-way development.

Available: Canadian Petroleum Association
phone: (403) 269-6721.

2. **The Resource Handbook, Operational Guidelines For Industry**

   Information: Document describes government guidelines which relate to timber salvage and disposal. Document also describes the techniques to be used in debris disposal.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.

3. **Forest Statistics Review**

   Information: File outlines number of miles of seismic lines, land cleared and financial reimbursement for timber damage.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.

4.3.3 FUEL STORAGE AND HANDLING

Specific guidelines for fuel storage and handling are as follows:

1. All personnel should be instructed in fuel handling procedures.
2. Temporary fuel storage containers should be situated 100m from the high water mark of any water body so that spillage or leakage will not reach the water.
3. Fuel tanks are preferable to bladders, and welded steel tanks are preferable to bolted ones.
4. Fuel storage areas should be clearly marked or barricaded to ensure that they are not damaged by moving vehicles. The markers should be visible under adverse weather conditions. Smoking should not be permitted within 10m of the fuel storage area. International "no smoking" signs should be posted.
5. Dykes should be built around fuel tanks to contain accidental spills and leakages (see Figure 3.3). The containment area should be 110% of the volume of the largest tank being contained. Provision should be made in the containment area to drain uncontaminated rain or snow melt water. Provision should also be incorporated into the design to drain the containment area into an impermeable pit or tank if required for spill cleanup. The containment area should not be located in a drainage channel and should have ditches constructed to divert any water around the area.
6. Fuel spills must be reported to the landowner, the ERCB and Alberta Environment's regional office responsible for the area (see Appendix C for contact list).
7. Proper electrical grounding should be provided for all fuel storage containers as well as for loading and offloading equipment.

4.3.4 WASTE DISPOSAL

Proper management of liquid and solid wastes will ensure that health regulations are met and that the area will have a neat and orderly appearance. For camp wastes and hazardous waste disposal, reference should be made to Sections 8.6 and 8.7 for additional guidelines. Specific environmental guidelines for drilling operations are presented below (see ERCB IL 85-16 and IL 83-10).

1. The company responsible for the well site should establish a reporting policy regarding type and quantities of waste.
2. Rig wastes, such as engine oil, waste oil, grease, etc., should be accumulated in containers for disposal in accordance with the requirements of a Forest Officer/Public Lands Officer.
3. Oil spills should be reported as required by the procedures established in the Oil Spill Contingency Plan (see Section 8.9).
4. Wastewater utilized in cleaning the rig, tools and equipment should be collected in reserve or storage pits and separated from the sump pits.

5. Drilling site and rights-of-way should be kept free of trash and litter. All trash, litter and garbage should be placed in metal or plastic containers with provisions for proper final disposal as approved by a Forest Officer, Public Lands Officer or the private landowner.
6. Garbage disposal sites should be used only for small, non-toxic, non-perishable refuse and incinerator residues. Holes or pits should be located above the expected high water level. A minimum distance from the bank of a water body of 45m is required in the Green Area.
7. Fuel barrels or other containers should not be left at the site or along the right-of-way, and should be removed progressively as work proceeds.
8. Combustible solid wastes must be incinerated on-site or disposed of off-site at an approved disposal facility.

Information available on liquid and solid waste disposal includes:

1. **Regulation of Hazardous Waste Generated by the Petroleum Industry in the Prairie Provinces**

   Information: Document outlines the various Acts and Regulations and how these provide specific information for waste disposal.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

2. **Waste Disposal Guidelines For The Petroleum Industry**

   Information: Document is used by oil and gas production personnel to dispose of oilfield and gas plant wastes using environmentally acceptable methods.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

3. **Guidelines For The Disposal of Sulphur Containing Solid Wastes**

   Information: Document outlines proper disposal techniques to prevent localized soil and groundwater contamination.

   Available: Standards and Approvals Division, Alberta Environment
   phone: (403) 427-5883.

4.3.5 DISPOSAL WASTE OF DRILLING FLUIDS AND SOLIDS

New regulation and guidelines are currently being prepared by the ERCB. For more information on these regulations the handbook User should contact the Energy Resources Conservation Board at (403) 297-8311.

Presently, ERCB Interim Directives ID-OG 75-2, ID 81-1 and IL 85-16 regulate disposal of sump fluids. The directives provide criteria for the disposal of sump fluids by three methods:

1. sub-surface disposal
2. on-lease disposal
3. off-lease disposal.

A document entitled "Waste Disposal Guidelines for the Petroleum Industry" was prepared in 1984. This document identifies two main sources of waste for drilling activities: waste drilling fluids, and workover and completion wastes.

4.3.5.1 Liquid Waste Containment

The main concern with liquid wastes is ensuring proper segregation so that handling and disposal can be undertaken effectively with little environmental impact. Berms and/or adequate dyking should be properly constructed and maintained to contain and permit the recovery of any spilled fluid. Every effort should be made to avoid spills and contain any accidentally spilled drilling fluids or chemicals within the lease. The guidelines for storing and segregating liquid wastes are as follows:

1. The waste drilling fluids should be stored in a main sump.

2. A concrete lined pit, metal tank or impervious lined pit must be used for the storage of oily wastes. Earthen structures will not be permitted (see IL 85-16).
3. Only drilling additives of chemically known composition should be used in the drilling mud system. Chemicals and materials should be clearly marked, neatly stacked and easily accessible.
4. Non-toxic drilling additives should be used whenever possible.
5. Lubricating oil, diesel fuel and other hydrocarbons must not be added to the main sump. Unused chemicals and/or completion fluids must not be added to the main sump unless prior approval has been obtained from the drilling supervisor responsible for the sump disposal program.
6. Any spilled drilling fluid should be contained and transferred to the sump. Fluids that are collected should be diverted through a charcoal filter before transfer to the sump.
7. Minimal amounts of biodegradable rig wash (value 100) should be used.
8. Rig wash detergents should not be used where KCl drilling fluids are in use or where they may be mixed with oils. Detergents will emulsify and disperse KCl fluids and oils into small droplets that are more readily absorbed by flora and fauna and are more difficult to treat for disposal. In general, rig wash fluids should be separated from the drilling fluids.
9. Fuel piping systems must be maintained in a leak free condition to prevent contamination of the sump or off-site drainage systems.
10. All flammable solid waste material must be burned in an approved incinerator or burn pit, or removed to an approved disposal site.
11. The sump is not a garbage pit. All solid waste materials that will not incinerate must be collected and stored for removal from the site. These materials include:
    a) scrap iron and steel
    b) oil cans and drums
    c) mud product containers and sacks
    d) grease cartridges
    e) casing protectors
    f) pump parts
    g) worn tong die and cables
    h) worn wire rope.

    In addition, the sump should not be used to collect solid wastes which could be incinerated on their own such as cardboard, wooden boxes and rags.

    Wire cable and wire rope should be cut in lengths and bundled for ease of handling. Burial of any of the above items is detrimental to the environment and a hindrance to further construction on the site.
12. Recovered test fluids should be diverted to the flare pit (when acceptable) or to a separate tank for alternate disposal.

Regarding sump construction and location, a typical lease layout showing sump and rig location, control dyke, diversion ditch and flare pit is illustrated in Figure 4.2.

The following are specific environmental guidelines for the construction and operation of sumps (PITS 1979):

1. The size of the drilling sump must be adequate for the anticipated volumes of the drilling fluid and should include 1m of freeboard, depending on the expected variables in the drilling program and on the region of Alberta.
2. The drilling sump should be excavated from an impervious, undisturbed subsoil and should be shaped to allow maximum reuse of clear water for mud make-up. Examples of sump design are given in Figures 4.3 to 4.6.

3. The sump should be located on the high side of the lease, and as far away from water bodies as possible, and the excavated material stockpiled in a location which will facilitate backfilling. The location must be approved by a Forest Officer prior to construction in the Green Area.

   Where the soil is such that an on-site sump would not be acceptable, all fluids must be tanked on-site and trucked to an approved disposal site.
4. Depending on surrounding contours and the sensitivity of the area, rain or snow runoff diversion ditches may be required around the lease. Containment berms are recommended on the low side of the lease (see Figure 4.2).
5. Where applicable, fences or other structures should be installed to prevent wildlife, people, and livestock from entering the sump.
6. If circulating tanks are required for sump fluids, the fluids must be hauled to a safe disposal site approved by a Forest Officer or Public Lands Officer. In the case of patented lands, the ERCB regional office (see Figure 2.9 and Appendix C) has jurisdiction and must be contacted. See section 4.3.5.2 for more information.
7. Sumps constructed in permeable soil material must be sealed by an acceptable clay or synthetic liner or other approved material to prevent leakage. Examples of excavation procedures and placement of fill material are shown in Figure 4.7b.
8. Well workover and completion wastes must be isolated from the main sump on completion of well drilling operations. A separate sump or tank with a minimum 320m^3 capacity must be constructed for this purpose. The flare pit may also be used if it is made sufficiently deep.

4.3.5.2 Waste Drilling Fluids

A wide variety of fluids are circulated down the drill string and returned to the surface during drilling. Although the prime purpose is to return drill cuttings to the surface, drilling muds serve many other functions: to cool and lubricate the bit, control pressure, reduce friction, etc.

When drilling mud returns to the surface, the cuttings are removed (shale shakers, desanders), and the mud is reconditioned and recirculated down the hole. After the well is finished the mud inventory and the accumulated waste in the drilling sump must be disposed of. The vast majority of waste muds are primarily composed of water, bentonite (clay) and drill cuttings.

During drilling, however, many additional chemicals are used to control drilling conditions. The drilling fluids and chemical additives also react with the unknown constituents of the formations which are drilled through. Since it is not possible to predict all the various elements which will be present in the drill cuttings, it is also not possible to know what chemical reactions will take place between the drilled material and the original mud system with its various chemical additives. The resultant sump fluids at the completion of drilling therefore form a very complex mixture.

Additional analytical information is required to evaluate the constituents of drilling sump fluids and their toxicity. For information on toxicity test requirements contact the ERCB (403) 297-8311. When this information has been compiled and evaluated, disposal methods may have to be adjusted to reflect that evaluation.

Most mud programs are simple beneficiated-Bentonite systems or Bentonite-chemical (lignosulphonate, soda ash, caustic, etc.) systems that contain no highly toxic chemicals. These two types of drilling fluids are the easiest to flocculate and chemically treat.

The drilling fluid types that present the more difficult and expensive lease cleanup problems are the invert emulsions, KCl muds, and those containing certain highly toxic polymers.

Some of the drilling fluids considered undesirable include:

1. diesel oil
2. crude oil
3. Drill Aid 420
4. preservatives (pentachlorophenols, paraformaldehydes)
5. Diversay (detergent)

6. chlorinated hydrocarbons
7. Safe-Guard
8. Kelzan X-C AL
9. RC-326 (polymer)
10. surfactants
11. dispersants
12. asbestos
13. galena
14. chromium
15. heavy metals

A significant potential for cost savings in the disposal of drilling fluids lies in proper water management during drilling operations. The following recommendations, if implemented, will reduce the cost of drilling fluid disposal and other aspects of drilling operations.

1. Circulating sumps should be used to settle out solids and recycle recoverable water for fluid make-up.
2. Steam or high pressure wash hoses with automatic shut-off should be used to limit total water and to reduce the quantity of rig wash detergent used.
3. Water meters should be used on the mud make-up line. A record of volumes used would provide incentive for reducing water use and allow for measurement of fluid loss to formations.
4. Proper maintenance of such solids control equipment as desanders, desilters, centrifuges, etc., should reduce the volume of mud discharged to the sump and, consequently, mud make-up costs. This could also possibly increase penetration rates, extend equipment life and decrease restoration costs.
5. Isolation pits or, preferably, tanks should be used to segregate different fluids, notably KCl muds, rig wash, frac and completion fluids. This would reduce cross-contamination, sump treatment costs and simplify restoration.
6. Less toxic drilling fluid components should be utilized.

The disposal options for the sump fluid are described as follows:

1. Preferred (Optimum Waste Disposal Practices)
   a) Conventional water-based drilling fluid

      The solids (cuttings, bentonite, etc.) can be disposed of by burial or surface spreading depending on circumstances at the time. Waste drilling fluids may be disposed of by either injection or to the surface. In the case of multi-well sumps, waste drilling fluids can be recycled to other drill sites.

      If the sump fluid meets acceptable criteria it can be pumped off the lease to the surrounding land but written consent must be obtained from the landowner. One analytical test of the fluid determines toxicity to fish. Microtox tests are not yet approved as of the date of this document except in the Wainright area. The handbook User should contact the ERCB (403) 297-8311 for an update on the use of Microtox.

      Disposal of fluid on the lease is permitted if the total disposal volume is less than 1000m^3 and there is little or no chance of migration. On-lease disposal is done by squeezing or by evaporation.

      Squeezing – Squeezing is conducted by adding fill to one end of the sump and gradually squeezing the fluid onto the lease surface. The fluid is then mixed with the soil to promote evaporation and absorption. The mixture is then squeezed back into the original pit (or additional pits if necessary) to mix with the subsoil and capped. Where feasible, squeezing is generally recommended for all areas.

Evaporation – Leaving the sump open to the air and letting the fluid evaporate is a slow and therefore expensive process. It is usually only applicable in hot, dry areas like southeastern Alberta.

In some cases evaporation can be enhanced by using a low-volume sprinkler system while drilling the well or the heat generated during the well test. Use of the latter would depend on the volume of gas available and the length of the test.

b) KCl fluids

KCl fluids should be segregated from other fluids used in the drilling program. Solids can be disposed of as in item "a" above but the handbook User should recognize that solid disposal is not as simple a procedure as discussed above. The following points should be noted:

(i) Squeezing/burial is discouraged by some of the regulatory agencies. The procedure should be reviewed with the Public Lands Officer or Forest Officer on Crown land or Alberta Environment Standards and Approvals (see Appendix C) on patented land.

(ii)Salt levels in solids may need to be reduced through washing the solids prior to disposal. Solids disposal must satisfy the chloride loading criteria and monitoring is necessary.

(iii) Where saturated KCl muds are used to drill through evaporite (salt) formations, the fluids and cuttings must be segregated from other drilling fluids and wastes. The fluids should be stored in lined sumps and then disposed of through deep well disposal (see Section 8.7)

c) Oil-based or Invert muds

The cuttings are transferred to a lined sump or steel tank. Free oil is collected and reused in the active mud system. At the completion of the well, the cuttings are spread on the lease and allowed to dry. After an initial drying period, the cuttings are worked into the disturbed surface soil layer and returned to the sump. Fertilizer addition may be necessary to promote degradation. Where oil-based or invert muds are used to drill through evaporite (salt) formations, the fluids must be handled as discussed in item b(iii) above.

2. Acceptable (not a permanent solution but generally safe)

a) Conventional water based fluids

These fluids may be disposed of by the procedures outlined above.

b) KCl fluids

KCl fluids should be segregated from other fluids used in the drilling program.

An acceptable alternative is to surface-spread (spray on roads, irrigation, etc.) the fluid. To pursue this option it must be shown that the chloride ion is the only deleterious chemical in the fluid and that the salt loading factor is within acceptable limits, for example less than 450 kg/ha. Approval for this alternative is required from the ERCB or other agencies.

On-lease disposal of KCl fluids (up to 1000m^3) using techniques described for conventional water-based fluids should also be considered if soil conditions and topography are favourable. The ERCB must be consulted if this option is chosen.

c) Oil-based or invert muds

Refer to preferred methods.

3. Unacceptable (will lead to pollution problems)

Two procedures which have been used in the past are considered unacceptable:

Trapping – Trapping is the capping-off of the drilling fluid within an impermeable pit which contains the fluid. The method has one major problem: the sump will frequently sink, thus requiring an expensive return trip to fill in the settled area.

Trenching – Trenching involves using a backhoe to dig deep slots into the lease, then allowing the slots to partially fill with sump fluid. Soil is pushed back into the trench in such a way that the fluid is absorbed into the soil rather than being trapped or capped. Since trenches may intersect sand or gravel, this procedure can lead to groundwater contamination.

4.3.5.3 Workover and Completion Wastes

During well completions or workovers, a variety of fluids may be circulated through the well to fracture the formation and otherwise maintain or improve fluid flow to the well bore. These fluids are returned back to tanks on the surface. The fluids which accumulate in the tanks at the well site must be disposed of in an acceptable manner.

Waste completion fluids, especially frac acids, should not be discharged to the drilling sump since this makes drilling fluid disposal much more difficult.

Disposal procedures for the most common workover wastes are listed below.

1. Preferred (Optimum waste disposal practices)
   a) Salt solutions (KCl, NaCl, $CaCl_2$): Deepwell disposal (see Section 8.7)
   b) Oil and oil/water emulsions: Run fluid through a production treater to salvage the oil and dispose of water down hole.
   c) Frac sand and proppants: Bury or spread on surface of the lease.
   d) Acid Water: Neutralize with slaked lime and dispose of down hole.
2. Acceptable (not a permanent solution but generally safe)
   a) Salt solutions: Approved disposal by road spraying.
   b) Oil and oil/water emulsions: If the company cannot process this material in its own treater, it may be handled by approved oil reclaimers.
   c) Frac Sand and proppants: See preferred methods.
   d) Acid Water: See preferred methods; neutralize and evaporate.
3. Unacceptable (will lead to pollution problems)
   a) Salt solutions: Disposal to drilling sump; pumping off lease; burial on lease.
   b) Oil and oil/water emulsions: Disposal to drilling sump; pumping off lease; burial on lease.
   c) Frac Sand and proppants: see perferred methods.
   d) Acid Water: Disposal to drilling sump; pumping off lease; burial on lease.

Information available on waste disposal includes:

1. **Waste Disposal Guidelines for the Petroleum Industry**
   Information:Document provides information and guidelines on drilling and production wastes.
   Available: Canadian Petroleum Association
   phone: (403) 269-6721

4.3.6 WILDLIFE, FISHERIES AND HABITAT PROTECTION

The operating guidelines provided in this section are established to protect wildlife and fisheries habitats from impacts associated with well site activities.

1. Well sites should be located so that there is minimum harrassment of wildlife and far enough from a water body to prevent deleterious materials, such as salt water, spilled oil and grease, from affecting habitat vegetation and water quality (see Section 4.3.1). The proponent should contact the regional Fish and Wildlife Habitat staff to identify the site location.
2. Where birds have been affected by spills, the Brooks Wildlife Centre, in Brooks, Alberta, is available for the purpose of returning previously cleaned birds to the wild state. The Fish and Wildlife Division of AFLW, however, will not physically undertake the cleaning unless the birds are rare, unique, or endangered.

3. During survey and scouting of the access road and lease, any indications of trapline activity should be noted and avoided where possible. Check with the local Fish and Wildlife Officer for registered traplines. The proponent may be required to pay compensation.
4. Construction and drilling should not take place during the nesting season of raptor and waterfowl (e.g. 1 May to 30 June) depending upon the distance from the nesting habitat and the species involved. This is especially true of colonial nesters and species such as the trumpeter swan. In key and critical ungulate wintering areas, construction and drilling activity should be restricted between 1 December and 1 May. The regional Fish and Wildlife Habitat staff (see Appendix C for contact list) should be contacted for such information.
5. Deep drilling activities may require as much as 18 months work. Continous drilling may not be permitted during the winter months. This can be determined by contacting the regional Forest Officer and Fish and Wildlife Officer. Shut-down dates would coincide with critical utilization periods by wildlife.
6. The deposition of any deleterious materials (salt water, oil, grease, garbage) on the ice or in a watercourse is prohibited. River crossings must comply with the guidelines presented in Section 8.1 for Access Roads, and Section 8.2 for Stream Crossings.
7. All wildlife encountered on roadways and drill sites must be given the right-of-way and must not be harrassed. Vehicles must stop and allow wildlife to cross without blowing horns or frightening the animals.

Information available on wildlife, fisheries and habitat protection includes:

1. **Fisheries Habitat Protection Guidelines**

   Information: Guidelines provide information to industry and government on fisheries concerns and specific land use activities.

   Available: Fish and Wildlife Division, AFLW
   phone: (403) 427-6734.

2. **Habitat Enhancement and The Petroleum Industry**

   Information: Report discusses habitat enhancement opportunities/techniques associated with the oil and gas industry.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

4.3.7 TERRAIN STABILIZATION

The techniques associated with terrain stabilization are site-specific. In areas where a bog or muskeg is encountered, it may be necessary to stabilize the area with the use of materials such as filter mats. In general, it is recommended that drilling through muskeg be done during the winter months. Techniques for terrain stabilization are discussed under Erosion Control in Section 8.5.

4.3.8 PROTECTION OF FRESHWATER HORIZONS AND MINERAL DEPOSITS

4.3.8.1 Freshwater Contamination

Adherence to the following guidelines should minimize the possibility of freshwater contamination during the drilling operation (API #2, 1975; AF & WD, 1979):

1. Water wells drilled for the purpose of providing a water supply should be authorized by the Controller of Water Resources, Alberta Environment. In addition, some municipalities require a water well permit. Wells should be located and cased to prevent any contamination. Before abandonment, wells should be properly plugged or sealed.
2. Surface and production casings should be set and cemented to the surface by the pump-and-plug, displacement, or other approved method, to a depth sufficient to protect all freshwater and to ensure against blowouts or uncontrolled flows.

3. In areas where freshwater strata or zones are encountered below the surface casing at such a depth as to make it impractical to set the full amount of surface casing necessary to cover or isolate all freshwater strata, the operator may, where allowed by applicable regulations, protect the freshwater zone by cementing the next casing string such that the freshwater zone is isolated.
4. Loss of drilling fluid to freshwater aquifers should be avoided. Caution should be exercised during all drilling operations to prevent casing ruptures.
5. Producing wells should be equipped with appropriate tubulars designed to maintain well control and prevent possible contamination of freshwater aquifers.
6. When a well is located where fluids could escape from the lease and enter a fish bearing watercourse, the company should construct and/or maintain a berm (around the perimeter of the well site or lease) with a height capable of witholding the maximum well output for a 48 hour period.
7. Berms and/or ditches should be constructed and maintained to prevent contamination of surface freshwater outside the lease. Berming should include the access to the well site, particularly if access is on the low side of the lease (see Figure 4.2).
8. When using a freshwater pond or lake as a water supply, pumps and engines should be located and/or equipped so as to prevent any hydrocarbon leaks from contaminating the water source.
9. Brines should not be allowed to come in contact with potable groundwater or allowed to escape over adjacent lands, enter streams, or seep into shallow freshwater aquifers. Disposal wells must meet ERCB standards (see Figure 8.7.1).
10. To ensure that melt and rain water safely drain from the lease, a system should be installed to facilitate draining. If a valve system is used, it should be kept closed except when draining the lease.

Information available on the protection of freshwater horizons includes:

1. **Fisheries Habitat Protection Guidelines**

   Information: Outlines specific guidelines regarding land use activities and the effects of industry development on watercourses.

   Available: Fish and Wildlife Division, AFLW
   phone: (403) 427-6734.

2. **Groundwater Reports and Bibliography**

   Information: Includes reports on groundwater evaluation, hydrogeological investigation, mapping, environmental impact assessment, soil drainage and contamination.

   Available: Earth Sciences Division, Alberta Environment
   phone: (403) 427-6230.

3. **Central Groundwater Data Manual File**

   Information: Ongoing file contains groundwater availability and production suitability inventories. Describes location, drilling logs, water analysis, water flows and completion reports.

   Available: Groundwater Information Section, Alberta Environment
   phone: (403) 427-6230.

4. **Hydrogeology, Miscellaneous Groundwater Geology and Related Maps**

   Information: A collection of reports and maps outlining groundwater resources.

   Available: Publication Sales, Alberta Research Council
   phone: (403) 438-1666.

4.3.8.2 Mineral Deposit Protection

The following operating guidelines should be followed to protect oil, gas or coal deposits from possible contamination:

1. When production quantities of mineral resources are exposed in the well bore, potential zones should be isolated from contamination before the well is abandoned.
2. Upon completion of a prospective oil or gas well, the casing should be set and cemented or open hole cement plugs placed across any zones with known potential mineral reserves to prevent migration of fluids to or from mineral zones.
3. In the event that drilling operations are suspended, the operator should take adequate and proper precautions to assure that formation fluids do not enter the well bore. The ERCB must approve any well suspension.

Figures 4.8 and 4.9 illustrate the appropriate environmental controls at a gas well installation and at an oil well respectively.

4.3.9 BLOWOUT PREVENTION PLAN

Regulations governing blowout prevention procedures are covered in the Oil and Gas Conservation Regulations and relevant amendments.

Blowout prevention guidelines provided by the American Petroleum Institute are as follows:

1. Select drilling fluid programs which provide safe drilling operations based on available data.
2. Use tubular casings/programs designed to permit safe drilling and completion of the well.
3. Utilizing all available information, plan casing setting depths which support safe drilling operations.
4. Use available abnormal pressure detection techniques and personnel trained in their application.
5. Train rig personnel for early detection and control of a fluid influx.
6. Guard against any drilling operations which may tend to swab in extraneous fluid. Always keep the hole full on trips. Provide equipment and/or suitable methods to accurately measure fill-up volumes. Maintain careful surveillance of pit volumes during all phases of the drilling operation.
7. Employ operating practices which minimize pressure surges and resulting loss of returns.
8. Test and maintain the blowout prevention equipment system on a planned basis. Such functional and/or pressure testing should meet or exceed regulatory requirements. All tests must be recorded with full particulars in the daily drilling log book.
9. Conduct scheduled and unscheduled blowout prevention drills to ensure drilling crews and service people know their proper places and job assignments for an emergency blowout condition.
10. Construct a 1m high berm on the well site around facilities which could result in the escape of deleterious material.

Information available on spill and blowout prevention includes:

1. **Blowout Prevention Review Committee Progress Reports**

   Information: Reviews the progress made by the committee formed as a result of ERCB Decision D 84-85.

   Available: Energy Resources Conservation Board
   phone: (403) 297-8311.

2. **Minimum Requirements For Blowout Prevention Equipment**

   Information: Outlines current guidelines as described in Part 8 of the Oil and Gas Conservation Act.

   Available: Energy Resources Conservation Board
   phone: (403) 297-8311.

3. **Lodgepole Blowout Inquiry – Phase 2 Sour Gas Well Blowouts in Alberta; Their Causes and Actions Required to Minimize Their Future Occurrences**

   Information: Inquiry report on causative factors of sour gas blowouts, and actions that can be taken to minimize future occurrences.

   Available: Energy Resources Conservation Board
   phone: (403) 297-8311.

4. **Lodgepole Blowout Inquiry - Phase I and Addendum**

   Information: Discusses causes of blowout and adequacy of actions taken to prevent it.

   Available: Energy Resources Conservation Board
   phone: (403) 297-8311.

5. **Training Courses Offered by the Petroleum Industry Training Service**

   a) Blowout Prevention Supervisors Courses.

   b) Well Service Blowout Prevention.

   Available: Petroleum Industry Training Service
   phone (403) 436-1445.

6. **Guidelines for Preparation of Emergency Procedure Plans for Drilling, Completion and Testing of Sour Gas Wells**

   Information: Document outlines plan contents, evacuation, ignition and post-emergency procedures.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

4.3.9.1 Evacuation and Ignition for Sour Wells

The ERCB has prepared an interim directive (ID 87-2) on evacuation and ignition policy as it applies to sour wells during drilling, completion, servicing and production.

The ERCB's policy is designed to ensure that if there is a release of hydrogen sulphide, the health and safety of the public is protected by either their evacuation from the area or, if evacuation is not practical, by ignition of the well. An exception to this ignition requirement is the case where the release rate is significantly low and there are no residents within a reasonable distance of the well.

Evacuation is the preferred alternative because it provides protection for the public as well as flexibility and timeliness in correcting the problem causing the H_2S release. However, evacuation may not be practical where there is a concentration of people within the potentially affected area or under certain special circumstances (e.g. factors such as weather conditions, monitoring information, well control procedures and reported health symptoms). Where evacuation is not practical, the health and safety of the public must be protected by ignition of the well.

The evacuation procedures and ignition criteria for sour wells should be set out in as much detail as possible in each individual operator's site-specific plans. These plans must take into consideration any special situation, conditions or features for that specific well. All site-specific plans must be approved by the ERCB.

In the event of an emergency where the evacuation criteria is satisfied, residents within the emergency planning zone must be evacuated immediately. Residents outside the emergency planning zone will be evacuated based on the results of air monitoring and the following guidelines, which are standards established by the Department of Community and Occupational Health for residents exposed to hydrogen sulphide.

1. If the one-hour average hydrogen sulphide concentration reaches 1.0 ppm or greater, sensitive persons should be notified and voluntary evacuation suggested.

2. If the one-hour average hydrogen sulphide concentration reaches 5.0 ppm, all persons should be notified and individuals experiencing increasing difficulty should be advised to evacuate.
3. If the hydrogen sulphide concentration reaches 20 ppm, all persons should be notified and requested to evacuate the area.

While 1. indicates that sensitive persons should be notified if the one-hour H_2S concentration outside of the emergency planning zone reaches 1.0 ppm, this does not mean that such persons within the potentially affected area outside the planning zone must be identified in advance. The intention of the policy is to ensure that where evacuation is practical, an operator has plans in place which would provide for the general notification of sensitive persons so that they would be able to evacuate the area if they wished to do so. The staff in the main control headquarters set up under the Government of Alberta Plan would also be involved in any notification to sensitive individuals.

The emergency response plan for a well that has a very high potential H_2S release rate and is located near a population centre which makes evacuation impractical, requires immediate ignition, with the provision that the ERCB could delay ignition if it was satisfied that control could be quickly regained with corrective action and that the health and safety of nearby residents would not be at risk.

For all sour wells, immediate ignition is not required unless there are people within the potentially affected area who cannot be evacuated and the H_2S release is so great as to jeopardize their safety. Ignition of such a well might be required at a later stage, depending on developments such as the results of monitoring and the extent of reported health symptoms.

4.3.10 FLARING DURING COMPLETION AND TESTING OF GAS AND OIL WELLS

Guidelines for the flaring and testing of sour gas from oil or gas wells are provided in The Oil and Gas Conservation Act, Alberta Regulation 151/71, Section 7.060. Procedures for the control of hydrogen sulphide are given in the Regulation in Sections 7.050 and 7.060(8).

Regulation 7.060 applies to any well which produces gas containing more than one percent hydrogen sulphide, or any higher or lower percentage which the ERCB may stipulate. Prior to flaring, the proponent must obtain written approval from the ERCB. The application for approval (regulation 15.240) must outline the reason for flaring, stack height and equipment to be used to flare the gas produced from a well during any well test, servicing or cleanup operation. The District Forest Officer should be contacted prior to the commencement of flaring during the period May 1 to November 1. For additional details, refer to the regulations prior to requesting flaring approvals.

Specific guidelines relating to liquid containment during the completion and testing of gas wells are as follows:

1. In all cases where liquid production may be expected, the contents of the well must be passed through a separator to separate the gaseous and liquid components.
2. The separated gas must be discharged to a flare stack and burned in accordance with the regulations under The Oil and Gas Conservation Act.
3. The separated liquid must be piped and stored in a closed, dyked tank. After the completion of testing, the liquid must be disposed of by a method approved by a Forest Officer or Land Use Officer and/or the ERCB.

Specific guidelines relating to flare pits by the American Petroleum Industry are as follows:

1. The flare pit (see Figure 4.2) must have sufficient freeboard to prevent overflow under maximum anticipated operating requirements.
2. The flare pit must be located where prevailing winds will reduce fire hazards and smoke nuisance. It also must be located at least 50m from the well head, as shown in Figure 4.2.
3. All necessary precautions must be taken to prevent contamination of streams and potable water. Depending on the specific situation, this could include the construction of berms and the use of impermeable liners.
4. During cleanup of a gas well, it could be necessary to direct the first returns to the flare pit. In these cases, the pit must be equipped with a pilot light to ensure that all gases are burned. As soon as feasible, however, production must be directed through a separator.

5. The flare pit should be designed to minimize sprays. A long, deep and narrow trench should be excavated and positioned in such a manner that the flare discharge will be directed down against the opposite side of the pit (see Figure 4.2).
6. In the case of a sour gas well, the separated gas resulting from procedure 4 above must be burned in a flare stack. In the case of a sweet well, the separated gas could be discharged to a flare stack or the flare pit.
7. In all cases, liquid resulting from the completion test must be piped to an appropriate tank and disposed of as directed by the Forest Officer or Land Use Officer.
8. Residents within the area of the well who may be affected by the test should be advised of the nature and duration of the test.

Further guidelines for flaring pit operations are available in ERCB IL 85-3, IL 83-3 and ID 85-4.

ERCB regulations for flare pits can be found in AR151/71; AR295/78 Section 8.08(2),(3).

4.3.11 WELL ABANDONMENT

The proponent must obtain abandonment approval from the Energy Resources Conservation Board prior to abandonment of a well or formation (see Table 2.1 and Appendix C). A copy of an abandonment application (ERCB form E21) can be found in Appendix D.

Well abandonment procedures are specified in Section 3.070 of The Oil and Gas Conservation Regulations (AR 151/71; AR 295/78):

"When a well is being abandoned, the licensee shall place a cement plug extending from a depth of at least 200 meters to surface, unless that interval is covered by casing which is cemented over the interval, but the Board may specify the depth of the plug for a specific well or area."

Guidelines are as follows:

1. Isolate abnormal pressure zones from normal pressure zones.
2. Isolate any known productive oil and gas zones and prevent migration of fluids in or out of these zones.
3. Isolate the open hole from the cased hole by a cement plug or a retainer-cement plug combination placed in the deepest cemented casing string which extends to the surface. (ERCB IL 84-1)
4. Plug all annulus spaces that are open to formations and that extend to the surface.
5. Place a surface cement plug below the ground surface in the smallest casing string which extends to the surface.
6. Remove casing below the ground surface as required by the ERCB (usually 1.0m).
7. Before the drill rig is moved away from the drill site, a tag indicating the company name and drill hole location must be placed within 10m from the actual drill hole.

4.3.12 RIG DISMANTLING AND SITE COMPLETION

Specific operational guidelines for dismantling the rig, disposing of sump fluids, restoring the soil profile and vegetation are as follows:

1. Upon completion of the well, rig components should be neatly stacked alongside the drilling site and/or right-of-way or on other approved sites.
2. The drilling site and right-of-way should be cleaned of any trash, waste oil, and other waste material.
3. All holes should be properly tagged, filled or plugged. Cellars should be filled or provided with a suitable cover. Test holes should be permanently abandoned within 10 days of the hole being drilled.
4. Flare and waste pits should be filled if no longer required.
5. When board roads and boards on the drilling site are dismantled, lumber, scraps, nails and debris should be removed from the surface.

6. Drilling fluids contained in the pits should be disposed of after drilling operations as per Section 4.3.5.
7. After the pits have dried, the pit area should be appropriately backfilled and restored using the originally excavated material. The soil profile should be restored to original or better condition. The covering fill should be built up above the general site level to allow for subsequent settlement of the fill material. Impermeable pit lining material should be removed. If backfilling and final cleanup is not feasible (e.g. due to spring break-up), the pit should be fenced to ensure the protection of livestock and wildlife.
8. After operations are completed, the drilling site should be restored, as far as practical, to a condition compatible with existing land use within one full growing season.
9. Slash from the preliminary clearing operation should be chopped or shredded, and spread over the pad surface to act as a mulch fostering revegetation.

Figure 4.10 illustrates environmental controls at a drilling rig.

4.4.13 RECLAMATION

Once the well is abandoned, the operator is required to reclaim the site.

For regulatory government procedures applicable to reclamation, and for application procedures to obtain Reclamation Certificates, see Sections 8.4 and 8.10.

4.3.14 NOISE CONTROL

Noise control guidelines are outlined in Sections 5.3.11, 7.3.8 and 8.8.

New directives are currently being prepared by the ERCB. For more information contact:

Energy Resources Conservation Board.
Phone: (403) 297-8311

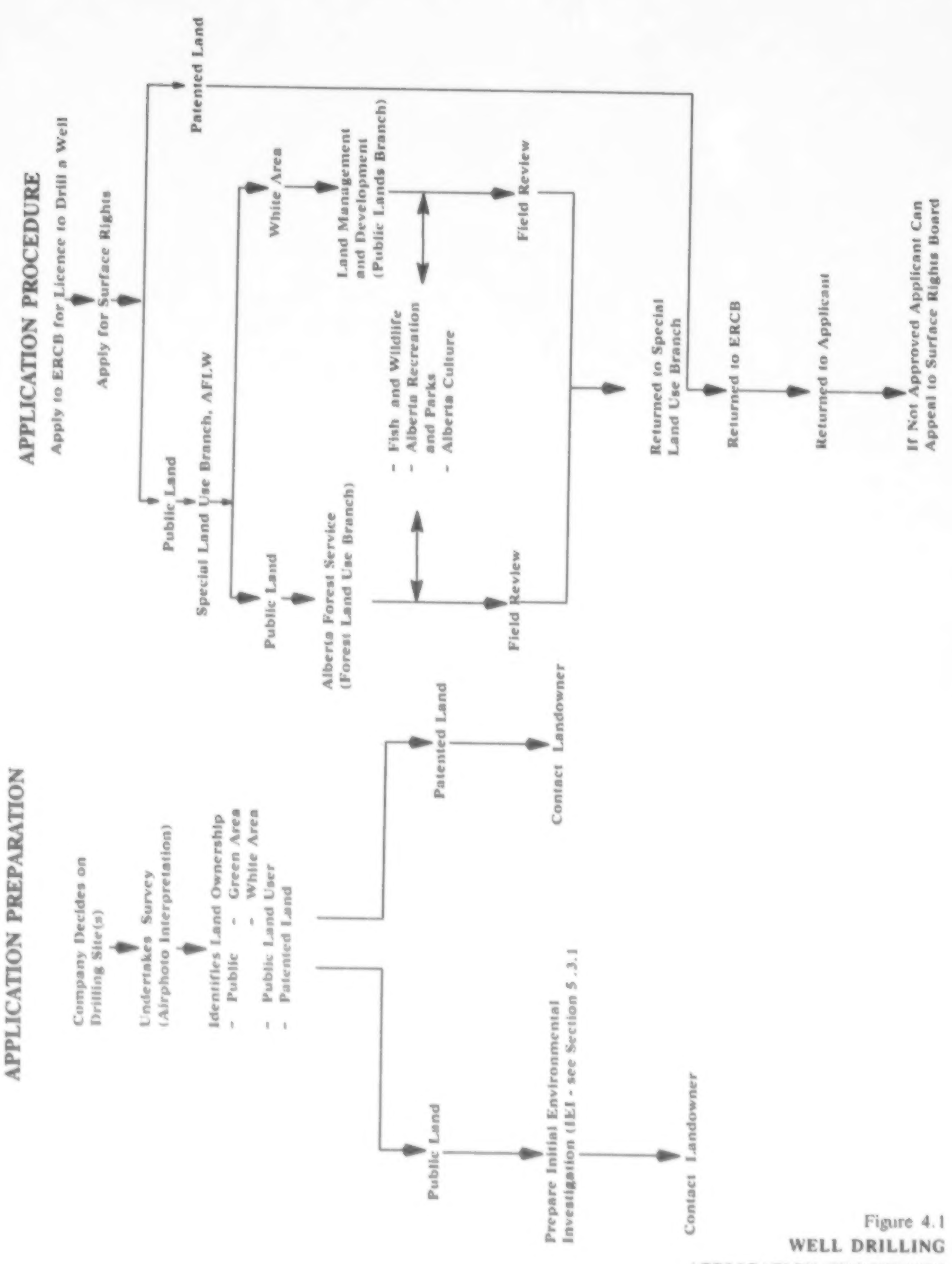

APPLICATION PREPARATION
Company Decides on Drilling Site(s)
Undertakes Survey (Airphoto Interpretation)
Identifies Land Ownership
- Public - Green Area
- White Area
- Public Land User
- Patented Land
Public Land
Prepare Initial Environmental Investigation (IEI - see Section 5.3.1
Contact Landowner
Patented Land
Contact Landowner
APPLICATION PROCEDURE
Apply to ERCB for Licence to Drill a Well
Apply for Surface Rights
Public Land
Special Land Use Branch, AFLW
Public Land
Alberta Forest Service (Forest Land Use Branch)
Field Review
White Area
Land Management and Development (Public Lands Branch)
Field Review
- Fish and Wildlife
- Alberta Recreation and Parks
- Alberta Culture
Patented Land
Returned to Special Land Use Branch
Returned to ERCB
Returned to Applicant
If Not Approved Applicant Can Appeal to Surface Rights Board

Figure 4.1
WELL DRILLING
APPLICATION PROCEDURE
(reference: David Bromley Engineering (1983) Ltd.)

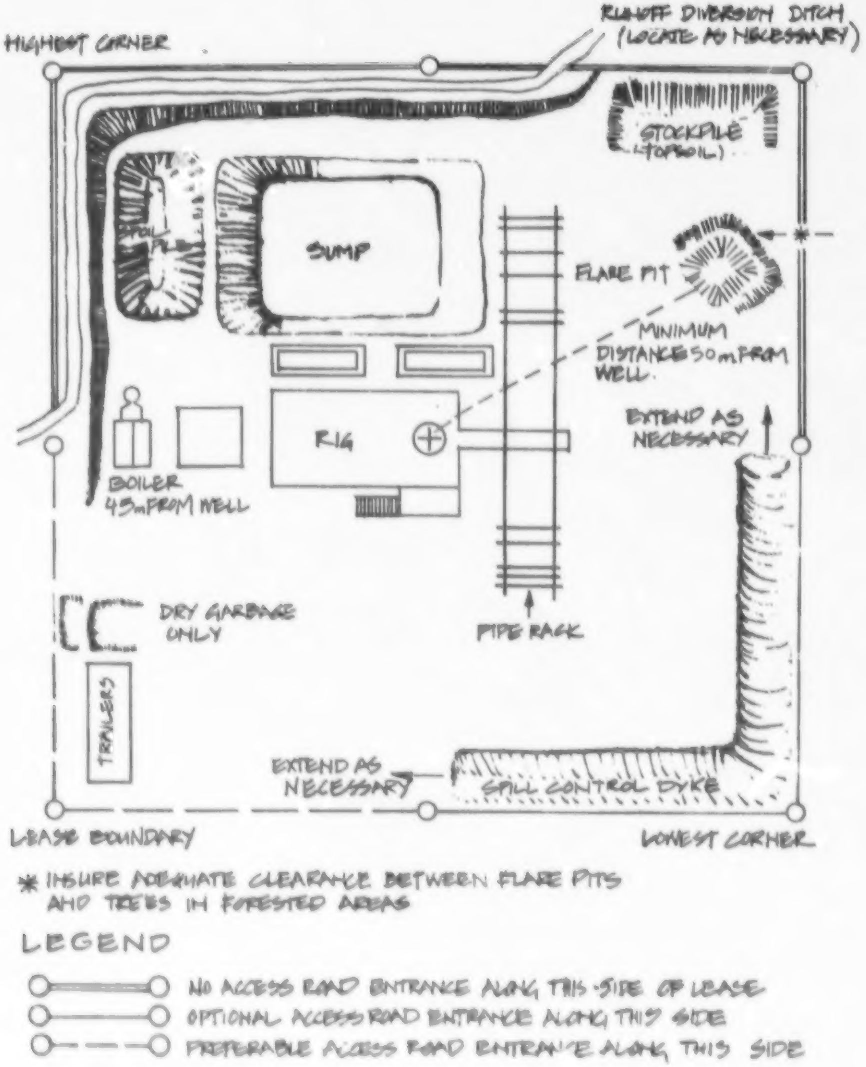

HIGHEST CORNER
RUNOFF DIVERSION DITCH (LOCATE AS NECESSARY)
STOCKPILE (TOPSOIL)
SPOIL PILE
SUMP
FLARE PIT
MINIMUM DISTANCE 50m FROM WELL.
EXTEND AS NECESSARY
RIG
BOILER 45m FROM WELL
DRY GARBAGE ONLY
PIPE RACK
TRAILERS
EXTEND AS NECESSARY
SPILL CONTROL DYKE
LEASE BOUNDARY
LOWEST CORNER
* INSURE ADEQUATE CLEARANCE BETWEEN FLARE PITS AND TREES IN FORESTED AREAS
LEGEND
NO ACCESS ROAD ENTRANCE ALONG THIS SIDE OF LEASE
OPTIONAL ACCESS ROAD ENTRANCE ALONG THIS SIDE
PREFERABLE ACCESS ROAD ENTRANCE ALONG THIS SIDE

Figure 4.2 TYPICAL LEASE LAYOUT

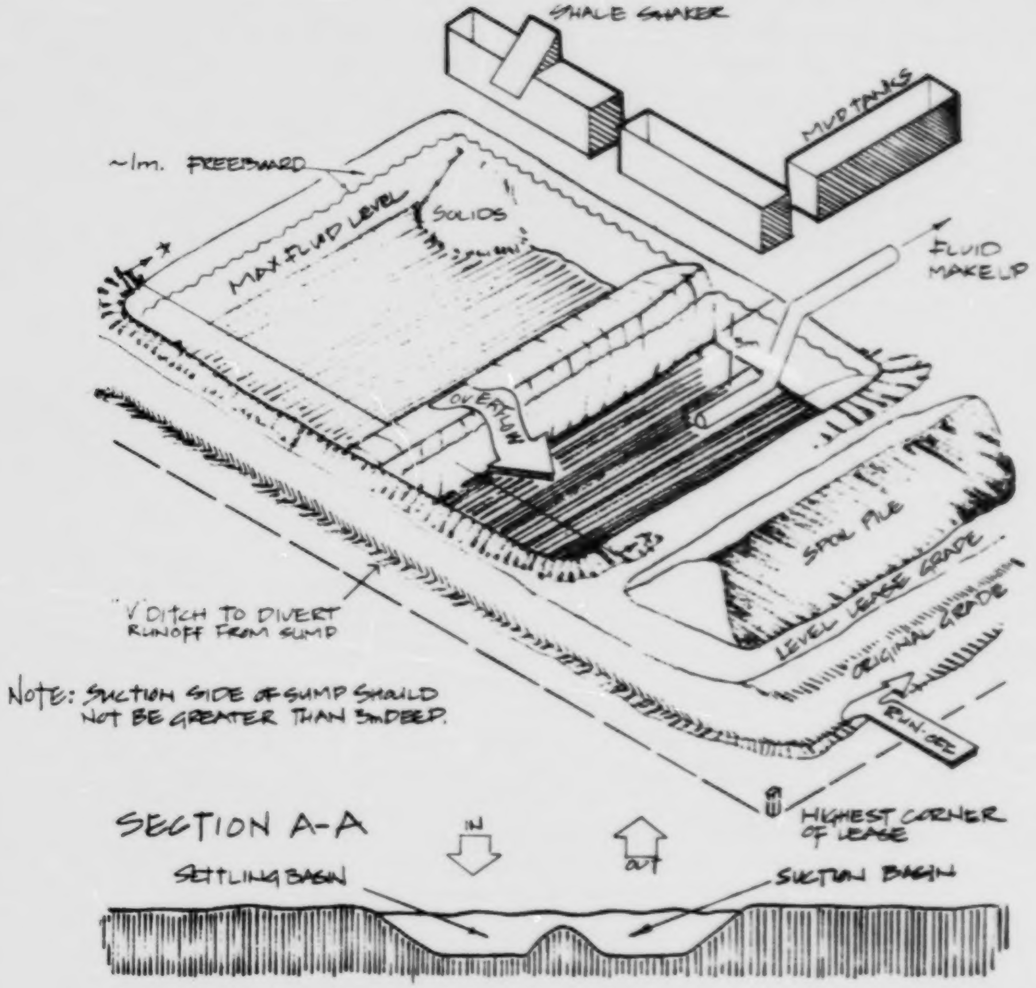

SHALE SHAKER
MUD TANKS
~1m. FREEBOARD
SOLIDS
MAX FLUID LEVEL
FLUID MAKEUP
OVERFLOW
SPOIL PILE
LEVEL LEASE GRADE
ORIGINAL GRADE
RUN-OFF
"V" DITCH TO DIVERT RUNOFF FROM SUMP
NOTE: SUCTION SIDE OF SUMP SHOULD NOT BE GREATER THAN 3mDEEP.
HIGHEST CORNER OF LEASE
SECTION A-A
IN
OUT
SETTLING BASIN
SUCTION BASIN

Figure 4.3 RECIRCULATING SUMP

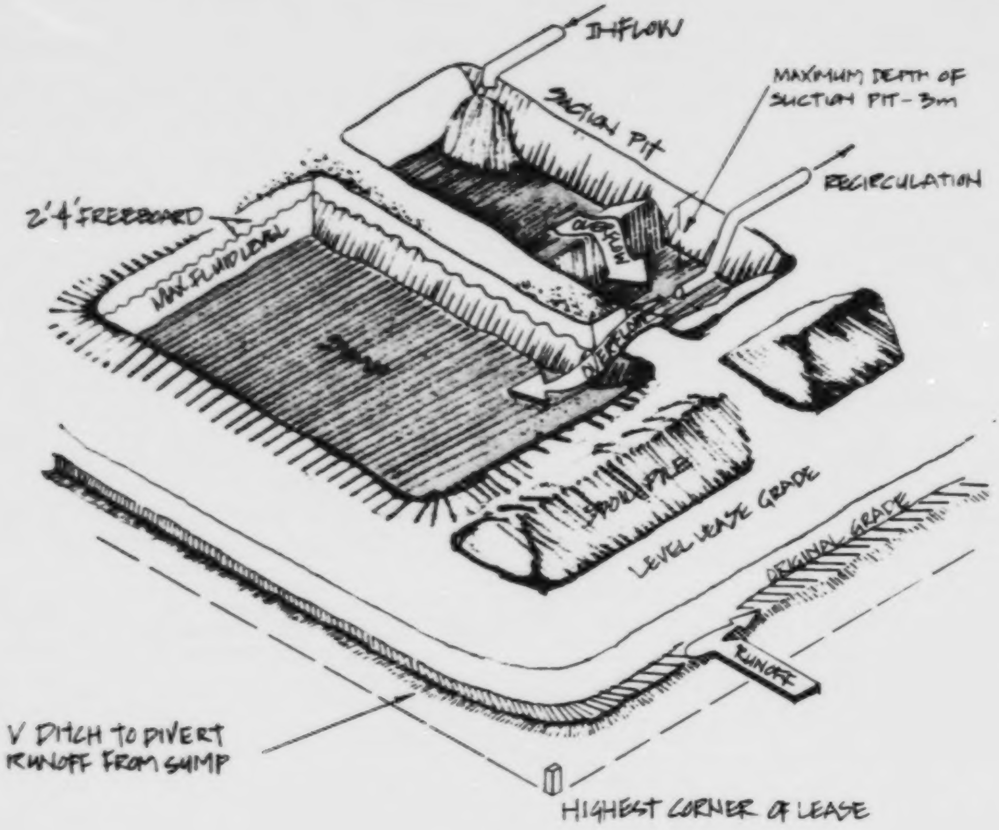

INFLOW
MAXIMUM DEPTH OF SUCTION PIT - 3m
SUCTION PIT
RECIRCULATION
2'4' FREEBOARD
MAX FLUID LEVEL
OVERFLOW
SUMP
OVERFLOW
SPOIL PILE
LEVEL LEASE GRADE
ORIGINAL GRADE
RUNOFF
V DITCH TO DIVERT RUNOFF FROM SUMP
HIGHEST CORNER OF LEASE

Figure 4.4 SHALLOW HOLE RECIRCULATING SUMP

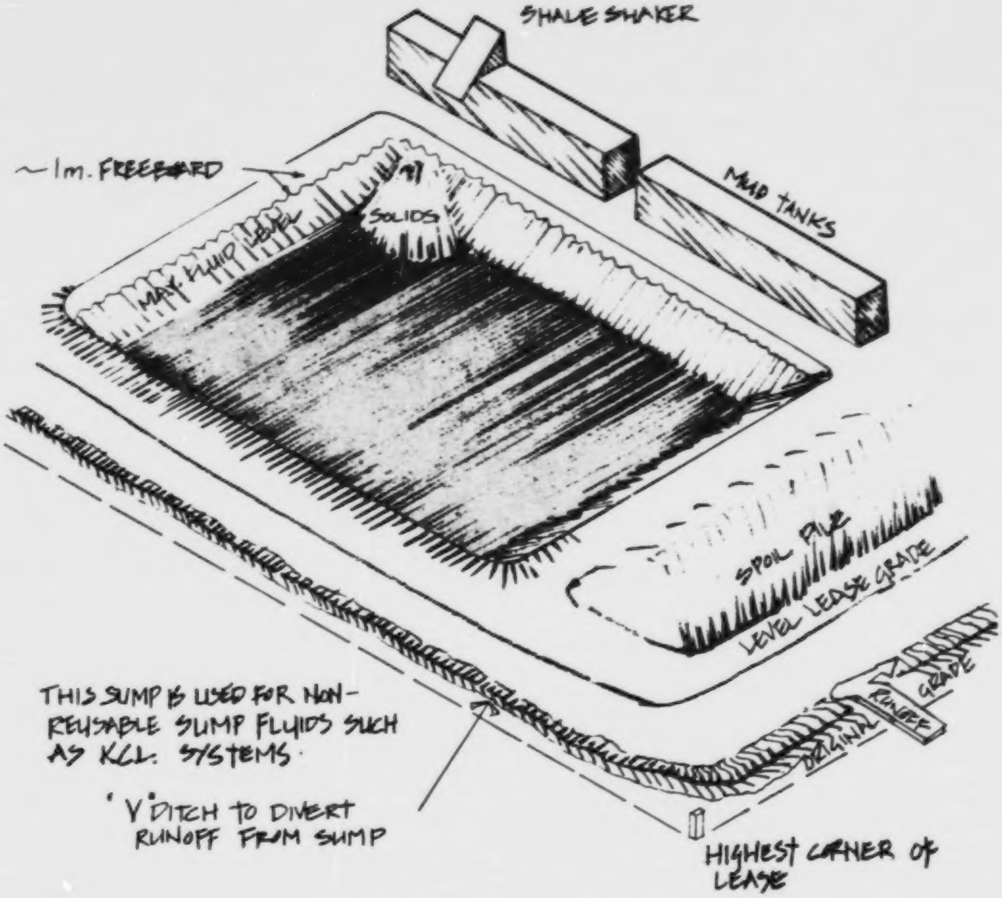
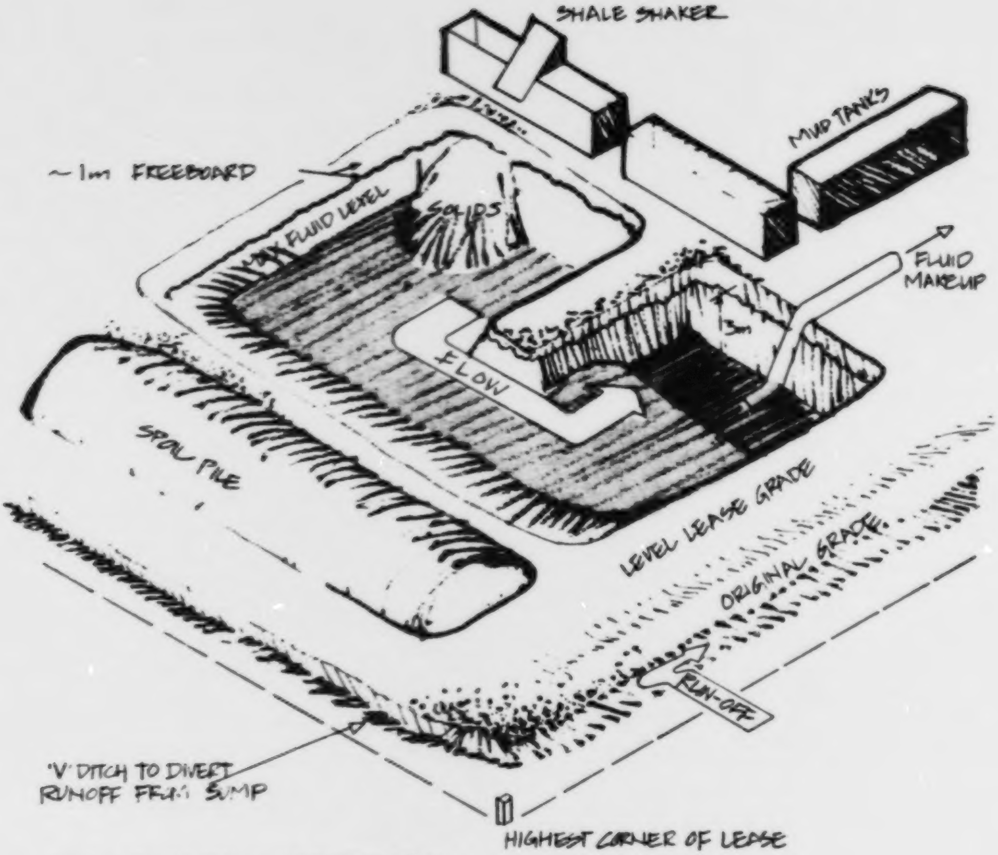

SHALE SHAKER
~1m. FREEBOARD
MUD TANKS
SOLIDS
MAX. FLUID LEVEL
SPOIL PILE
LEVEL LEASE GRADE
ORIGINAL
RUNOFF
GRADE
THIS SUMP IS USED FOR NON-REUSABLE SUMP FLUIDS SUCH AS KCL SYSTEMS.
'V' DITCH TO DIVERT RUNOFF FROM SUMP
HIGHEST CORNER OF LEASE

Figure 4.5 NON-RECIRCULATING SUMP


SHALE SHAKER
MUD TANKS
~1m FREEBOARD
MAX FLUID LEVEL
SOLIDS
FLUID MAKEUP
3m
FLOW
SPOIL PILE
LEVEL LEASE GRADE
ORIGINAL GRADE
RUN-OFF
'V' DITCH TO DIVERT RUNOFF FROM SUMP
HIGHEST CORNER OF LEASE

SUCTION BASIN SHOULD NOT BE DEEPER THAN 3m

Figure 4.6 RECIRCULATING SUMP - ALTERNATE LAYOUT

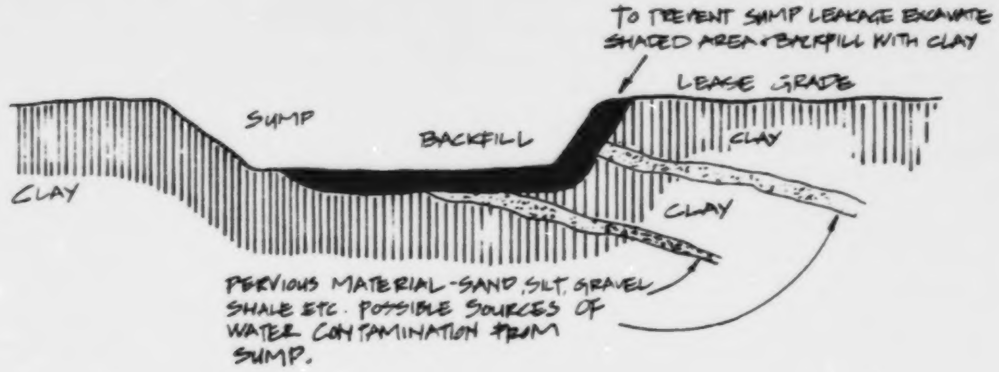

TO PREVENT SUMP LEAKAGE EXCAVATE SHADED AREA & BACKFILL WITH CLAY
LEASE GRADE
SUMP
BACKFILL
CLAY
CLAY
CLAY
PERVIOUS MATERIAL - SAND, SILT, GRAVEL, SHALE ETC. POSSIBLE SOURCES OF WATER CONTAMINATION FROM SUMP.

Figure 4.7 (a) PREVENTION AGAINST GROUNDWATER CONTAMINATION

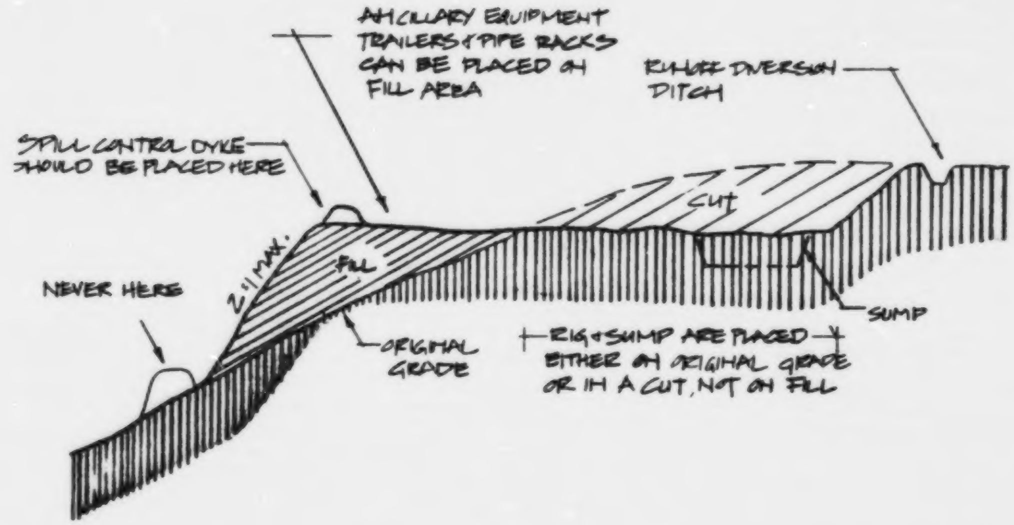
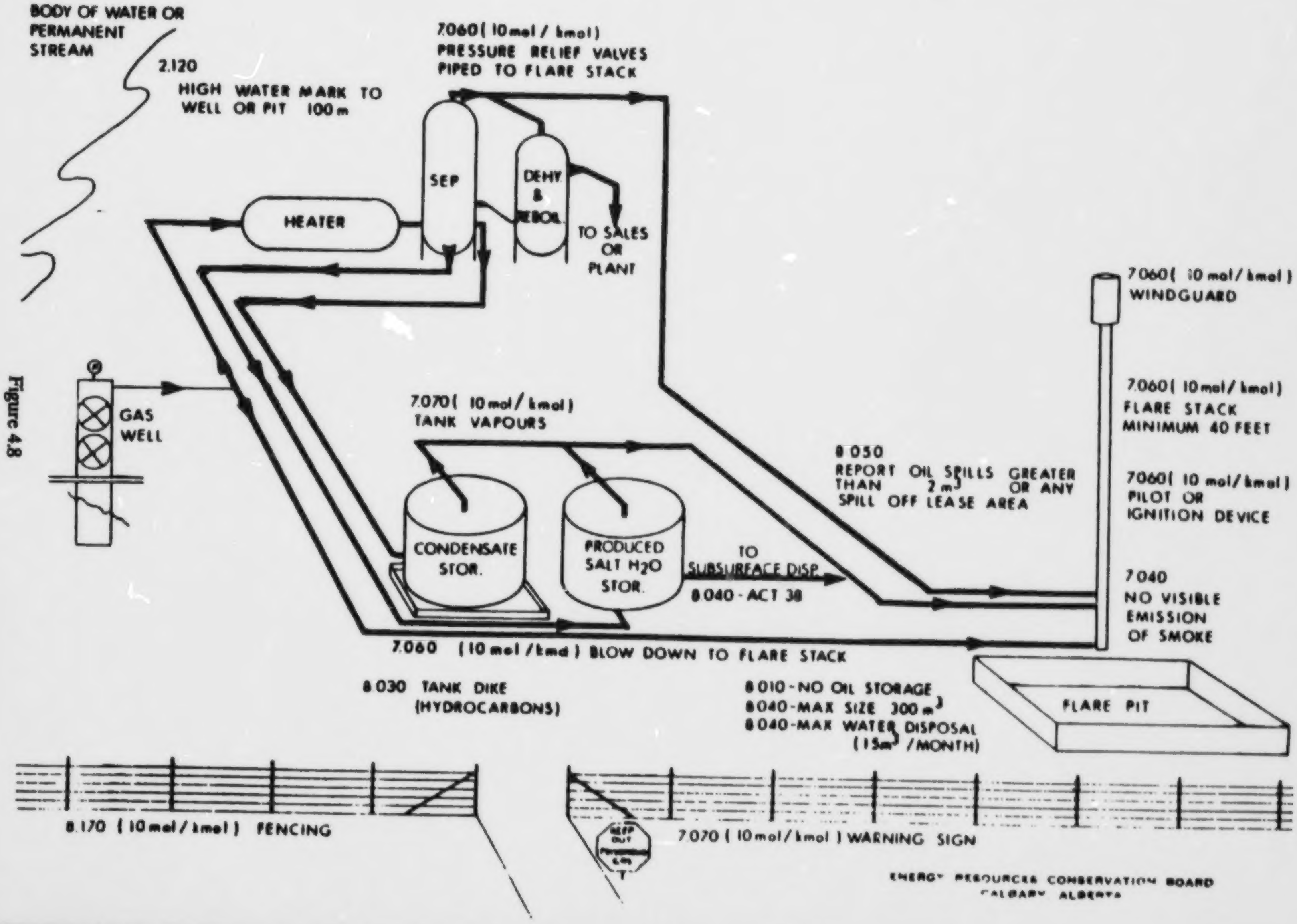

ANCILLARY EQUIPMENT TRAILERS & PIPE RACKS CAN BE PLACED ON FILL AREA
RUNOFF DIVERSION DITCH
SPILL CONTROL DYKE SHOULD BE PLACED HERE
CUT
2:1 MAX.
FILL
NEVER HERE
SUMP
ORIGINAL GRADE
RIG & SUMP ARE PLACED EITHER ON ORIGINAL GRADE OR IN A CUT, NOT ON FILL

Figure 4.7 (b) CROSS-SECTION OF A LEASE ON SLOPING GROUND

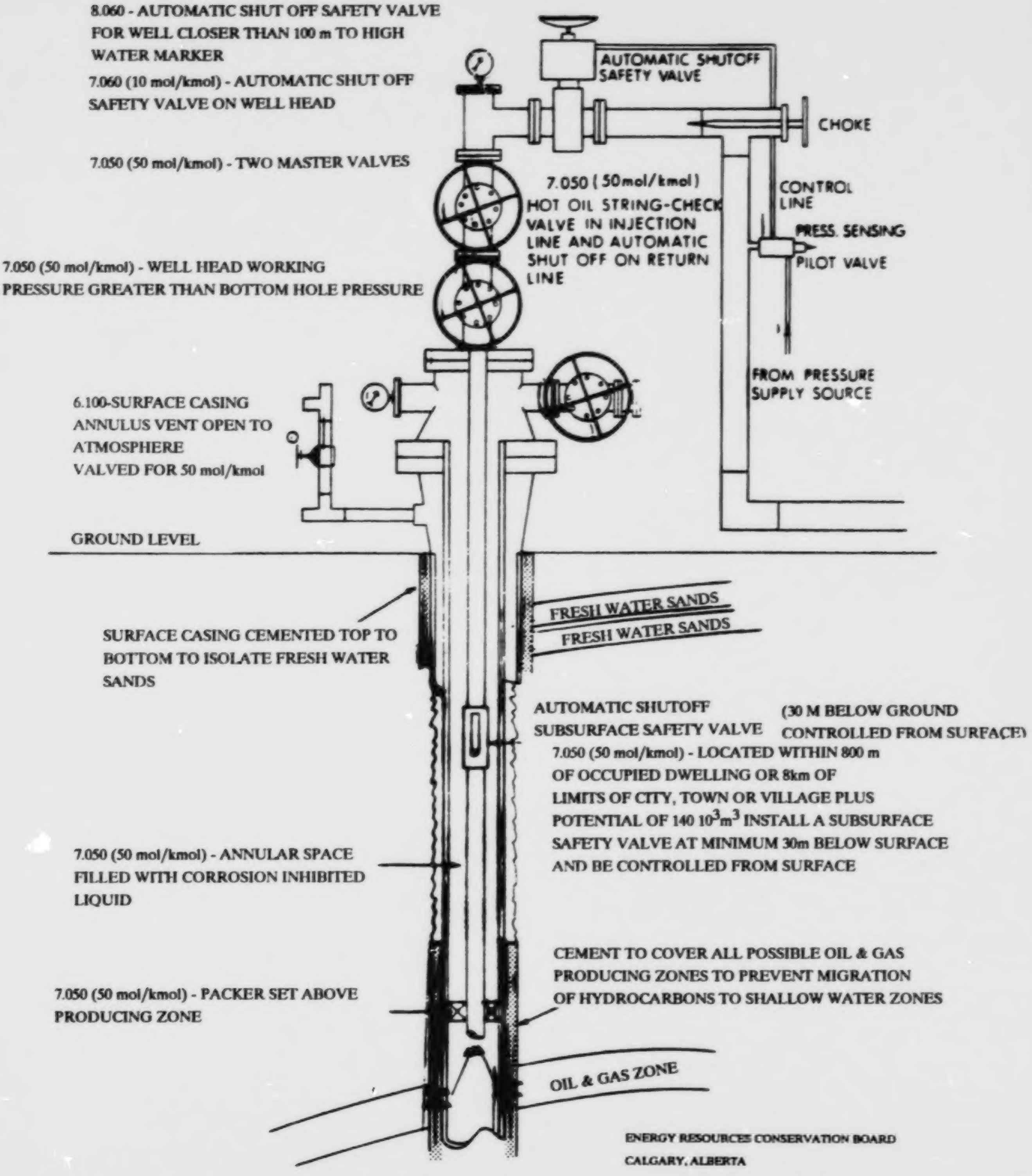
ENVIRONMENTAL CONTROL AT A GAS WELL INSTALLATION


BODY OF WATER OR PERMANENT STREAM
2.120
HIGH WATER MARK TO WELL OR PIT 100 m
7.060 (10 mol / kmol)
PRESSURE RELIEF VALVES PIPED TO FLARE STACK
HEATER
SEP
DEHY & REBOIL
TO SALES OR PLANT
GAS WELL
7.070 (10 mol / kmol)
TANK VAPOURS
CONDENSATE STOR.
PRODUCED SALT H2O STOR.
TO SUBSURFACE DISP.
8.040 - ACT 38
8.050
REPORT OIL SPILLS GREATER THAN 2 m³ OR ANY SPILL OFF LEASE AREA
7.060 (10 mol / kmol)
WINDGUARD
7.060 (10 mol / kmol)
FLARE STACK
MINIMUM 40 FEET
7.060 (10 mol / kmol)
PILOT OR IGNITION DEVICE
7.040
NO VISIBLE EMISSION OF SMOKE
7.060 (10 mol / kmol) BLOW DOWN TO FLARE STACK
8.030 TANK DIKE (HYDROCARBONS)
8.010 - NO OIL STORAGE
8.040 - MAX SIZE 300 m³
8.040 - MAX WATER DISPOSAL (15 m³ / MONTH)
FLARE PIT
8.170 (10 mol / kmol) FENCING
7.070 (10 mol / kmol) WARNING SIGN

ENERGY RESOURCES CONSERVATION BOARD
CALGARY ALBERTA

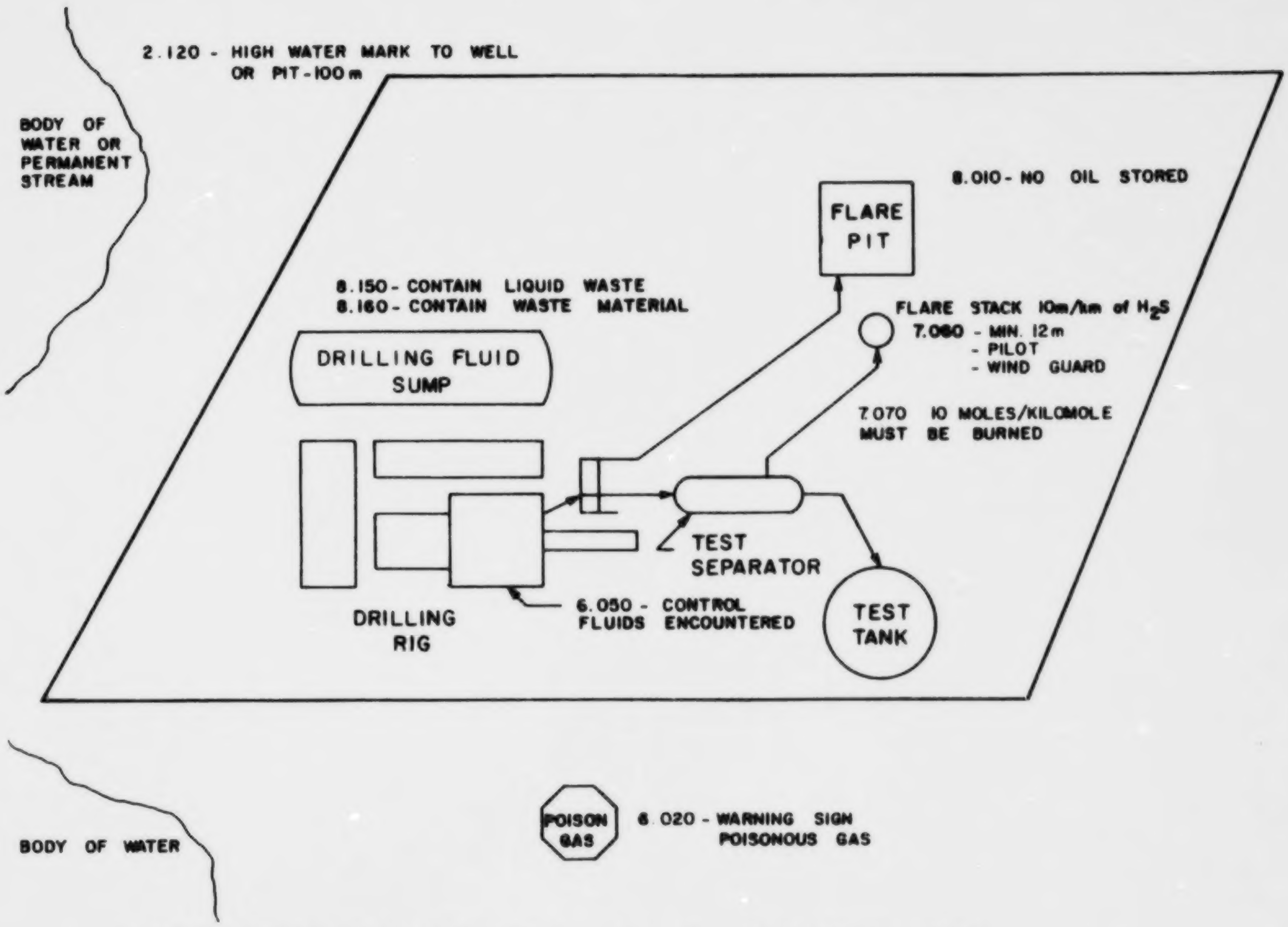
Figure 4.8

ENVIRONMENTAL CONTROL AT A WELL


8.060 - AUTOMATIC SHUT OFF SAFETY VALVE FOR WELL CLOSER THAN 100 m TO HIGH WATER MARKER
7.060 (10 mol/kmol) - AUTOMATIC SHUT OFF SAFETY VALVE ON WELL HEAD
AUTOMATIC SHUTOFF SAFETY VALVE
CHOKE
7.050 (50 mol/kmol) - TWO MASTER VALVES
7.050 (50mol/kmol) HOT OIL STRING-CHECK VALVE IN INJECTION LINE AND AUTOMATIC SHUT OFF ON RETURN LINE
CONTROL LINE
PRESS. SENSING
PILOT VALVE
7.050 (50 mol/kmol) - WELL HEAD WORKING PRESSURE GREATER THAN BOTTOM HOLE PRESSURE
FROM PRESSURE SUPPLY SOURCE
6.100-SURFACE CASING ANNULUS VENT OPEN TO ATMOSPHERE VALVED FOR 50 mol/kmol
GROUND LEVEL
FRESH WATER SANDS
FRESH WATER SANDS
SURFACE CASING CEMENTED TOP TO BOTTOM TO ISOLATE FRESH WATER SANDS
AUTOMATIC SHUTOFF SUBSURFACE SAFETY VALVE
(30 M BELOW GROUND CONTROLLED FROM SURFACE)
7.050 (50 mol/kmol) - LOCATED WITHIN 800 m OF OCCUPIED DWELLING OR 8km OF LIMITS OF CITY, TOWN OR VILLAGE PLUS POTENTIAL OF 140 10³m³ INSTALL A SUBSURFACE SAFETY VALVE AT MINIMUM 30m BELOW SURFACE AND BE CONTROLLED FROM SURFACE
7.050 (50 mol/kmol) - ANNULAR SPACE FILLED WITH CORROSION INHIBITED LIQUID
CEMENT TO COVER ALL POSSIBLE OIL & GAS PRODUCING ZONES TO PREVENT MIGRATION OF HYDROCARBONS TO SHALLOW WATER ZONES
7.050 (50 mol/kmol) - PACKER SET ABOVE PRODUCING ZONE
OIL & GAS ZONE

ENERGY RESOURCES CONSERVATION BOARD
CALGARY, ALBERTA

Figure 4.9


2.120 - HIGH WATER MARK TO WELL
OR PIT-100 m
BODY OF
WATER OR
PERMANENT
STREAM
8.010- NO OIL STORED
FLARE
PIT
8.150- CONTAIN LIQUID WASTE
8.160- CONTAIN WASTE MATERIAL
FLARE STACK 10m/km of H_2S
7.060 - MIN. 12 m
- PILOT
- WIND GUARD
DRILLING FLUID
SUMP
7.070 10 MOLES/KILOMOLE
MUST BE BURNED
TEST
SEPARATOR
6.050 - CONTROL
FLUIDS ENCOUNTERED
DRILLING
RIG
TEST
TANK
BODY OF WATER
POISON
GAS
6.020 - WARNING SIGN
POISONOUS GAS

ENVIRONMENTAL CONTROL AT A DRILLING RIG

Figure 4.10

TABLE OF CONTENTS

5.0 CONVENTIONAL OIL AND GAS PRODUCTION FACILITIES: GAS PLANTS, COMPRESSOR FACILITIES AND BATTERIES

5.1 Application Procedures
5.2 Jurisdictions, Permits and Approvals
5.3 Specific Environmental Guidelines
    5.3.1 Site Selection, Alignment and Access Considerations
    5.3.2 Clearing, Timber Salvage and Debris Disposal
    5.3.3 Site Drainage
    5.3.4 Wildlife and Habitat Protection
    5.3.5 Pollution Control Design Requirements
    5.3.6 Product Storage and Handling
    5.3.7 Waste Disposal
    5.3.8 Sulphur Handling
    5.3.9 Gaseous Emissions
    5.3.10 Waterfloods
    5.3.11 Noise Control
    5.3.12 Spill Prevention and Containment

LIST OF TABLES

Number	Title
5.1	Environmental Concerns Directory
5.2	Canada Ambient Air Quality Objectives
5.3	Minimum Distance Requirements Separating Proposed Sour Gas Wells from Residential and Other Developments

LIST OF FIGURES

Number	Title
5.1	Application to Construct and Operate Production Facilities
5.2	Environmental Control at an Oil Production Battery
5.3	Environmental Control at a Gas Production Facility
5.4	Environmental Control at a Gas Processing Plant

5.0 CONVENTIONAL OIL AND GAS PRODUCTION FACILITIES: GAS PLANTS, COMPRESSOR FACILITIES AND BATTERIES

The site selection, design, construction and operation of a primary gas plant or battery is controlled under The Oil and Gas Conservation Regulations (AR 151/71). Under the Regulations, formal written application must be made to the ERCB to obtain approval for the location, design, construction and operation of any such facility.

Table 5.1 is a quick reference which outlines environmental concerns, the location of information within this handbook and the regulatory contact for each environmental concern.

In addition, the proponent must consider the environmental implications of the particular production facility and the future infrastructure (e.g. powerlines, pipelines, roads, etc.).

Relevant ERCB Interim Directives (ID) and Informational Letters (IL) for this section are:

ID 87-2	Minimum Distance Requirements Separating Proposed Sour Wells from Residential and Other Developments
IL-OG 76-24	Stack Exit Temperatures for Acid Gas Incinerators Associated with Gas Processing Plants
IL 79-16	Revised Incinerator Stack Exit Temperature Criteria for Plants Processing Sour Gas
IL 80-24	Sulphur Recovery Guidelines-Gas Processing Operations
IL 80-30	Application for Approval of Natural Gas Compressors
IL 84-11	Approval, Monitoring, and Control of Sulphur Storage Sites
IL 85-16	Storage, Handling, and Disposal of Oily Wastes
IL 86-2	Criteria for Exemption of Sweet Gas Processing Plants - Clean Air and Water Acts.

5.1 APPLICATION PROCEDURES

Prior to construction of a battery, primary gas plant or compressor facility, application for approval must be made to the ERCB. Details of the requirements are given in Sections 15.210 and 15.050 of The Oil and Gas Conservation Regulations (AR 151/71). Surface rights must be secured from the landowner and evidence that rights have been obtained should be submitted with the application. Figure 5.1 displays the key factors in the application process. Guide G26, Sour Gas Processing Plant Applications to the ERCB - A Guide to Content, prepared by the ERCB and Alberta Environment aids in the application procedure. Information requirements are as follows:

1. legislation
2. public awareness
3. associated facilities
4. project description including site alterations
5. technical information
6. biophysical and social information including land-use information, air quality, water quantity and quality, solid waste, fish and wildlife, vegetation and soils, geology, climate factors and social issues
7. environmental monitoring
8. economic information.

A new sour gas plant or a large sweet gas plant (e.g. 560000m^3 per day) may require an Environmental Impact Assessment (EIA).

Impact Assessment Guidelines are available from:

Environmental Impact Assessment Division, Alberta Environment
phone: (403) 427-6224

TABLE 5.1

SECTION 5 – CONVENTIONAL OIL GAS PRODUCTION FACILITIES GAS PLANTS, COMPRESSOR FACILITIES AND BATTERIES ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Site Selection, Alignment and Access Considerations	5.3.1	• See Appendix C for regional offices of Alberta Transportation, regional offices of Forest Regions and Public Lands of AFLW • See Appendix C for resource specialists of AFLW
Clearing, Timber Salvage and Debris Disposal	5.3.2	• Same as above
Site Drainage	5.3.3, 8.5 8.7.7.3	• Same as above • See Appendix C for Water Resources regional office of Alberta Environment
Wildlife and Habitat	5.3.4	• See Appendix C for Fish and Wildlife regional offices of AFLW
Pollution Control	5.3.5	• Alberta Environment – Air Quality (427–5893) – Pesticides (427–5855) – Wastewater (427–5868) – Water Quality (427–5828)
Product Storage	5.3.6	
Waste Disposal	5.3.7	• Alberta Environment, Waste Management (427–5868)
Sulphur Handling	5.3.8, 8.7	• ERCB – Environment Protection (297–8121) • See Appendix C for regional offices of ERCB
Gaseous Emissions	5.3.9	• Alberta Environment, Air Quality (427–5893)
Noise Control	5.3.11	• ERCB – Environment Protection • See Appendix C for regional field offices of ERCB (297–8121)
Spill Prevention and Containment	5.3.12, 8.4.3	• Same as above

TABLE 5.1 (continued)

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Water Supply – Water Floods	5.3.10	• Alberta Environment Ground Water (427-6241) Surface Water (427-7054)
Decommissioning and Abandonment	8.10	• Same as above
Reclamation	8.4	• Alberta Environment Reclamation (427-6323) • See Appendix C for regional reclamation offices
Access Roads	8.1	• Municipal Jurisdiction • Alberta Transportation (See Appendix C for regional offices) • Existing road owner or if on Crown land, contact Forest or Public Lands officer (see Appendix C for regional field offices of AFLW)
Stream Crossings	8.2	• Same as above • See Appendix C for Fish and Wildlife regional offices AFLW • See Appendix C for regional offices of Alberta Environment
Sand, Gravel or Borrow Areas	8.3	• Same as above
Erosion	8.5	• Same as above
Camps	8.6	• See Appendix C for forest region or public land region field personnel

5.2 JURISDICTIONS, PERMITS AND APPROVALS

Permits, licences and approvals are outlined in Table 2.1.

The two main Acts which legislate the environmental requirements for production facilities are the Clean Air and Clean Water Acts. These Acts come under the jurisdiction of Alberta Environment.

Sour gas plants are the main type of production facility that are of major environmental concern. IL 86-2 describes criteria for the exemption of certain types and sizes of sweet gas processing plants from approval requirements under the Clean Air and Clean Water Acts.

These criteria are as follows:

1. Clean Air Act

   A sweet gas plant is exempt from Sections 3, 4, and 5 of the Clean Air Act if its total oxides of nitrogen (NO_x) emissions are equal to or less than 16 kg/hr.

   To determine if a sweet gas plant is exempt from licensing under the Clean Air Act, estimate the total NO_x emission ($NO + NO_2$) using one of the following:

   a) manufacturer's NO_x emission factors

   b) United States Environmental Protection Agency (U.S. E.P.A.) NO_x emission factors ("Compilation of Air Pollutant Emission Factors, Publication" AP-42 (1981))

   c) the following factors:

      (i) gas-fired internal combustion reciprocating engines - 1481×10^{-9} g/J
      (ii) gas-fired turbines - 126×10^{-9} g/J
      (iii) gas-fired steam generating units, heaters, boilers - 99×10^{-9} g/J
      (Where g/J denotes grams of NO_x per Joule of energy input to the unit).

   Maximum rated horsepower for normal operation, corrected for site elevation, shall be used in the determination of total NO_x. Such corrections must be documented.

   NO_x emissions from flare stacks and pits may be excluded.

   Intermittent NO_x emissions from standby equipment and equipment used for emergency purposes may be omitted from the total NO_x calculation. For the purpose of this exemption, standby equipment does not include equipment idle as a result of over-design or temporary reductions in throughput.

   Any subsequent expansion or modification to a sweet gas plant that results in the total NO_x emissions exceeding 16 kg/hr will render the plant subject to the approval requirements of the Clean Air Act.

   Note that regardless of exemption status, the requirement that exhaust stack heights be not less than 1.5 times the peak height of the associated building is still in effect.

2. Clean Water Act

   A sweet gas plant is exempt from Sections 3, 4, and 5 of the Clean Water Act if the following criteria are met:

   a) no industrial landfill on site;
   b) no sewage produced, or any sewage which is produced goes to a pit-type toilet, sewage field, leaching cesspool, or municipal plant;
   c) no discharge of process liquids, waste liquids, or produced water to the surrounding watershed;
   d) all above ground tanks for the containment or treatment of process water, wastewater, waste liquids, sewage, or produced water must be dyked;
   e) no on-site pits, ponds, or lagoons for the containment or treatment of liquids, except flare pits or other small pits which comply with the Oil and Gas Conservation Regulations;
   f) no wastewater irrigation on site;
   g) minimal probability of spills or leaks which would contaminate surface runoff water, groundwater, or soil.

These criteria supersede the requirements for licencing and operation of sweet Class A plants as outlined in the "Gas Processing Waste Water Management Standards - September 1973" issued by Alberta Environment.

5.3 SPECIFIC ENVIRONMENTAL GUIDELINES

5.3.1 SITE SELECTION, ALIGNMENT AND ACCESS CONSIDERATIONS

A key to proper site selection is to meet with the field personnel of the responsible land management agencies (e.g. Forest or Public Lands Officer) or private landowners prior to making formal application.

The proponent should take a copy of the Initial Environmental Investigation form. This form will act as a checklist and ensure that all of the proper information for the application is submitted. The IEI forms are available from the Special Lands Disposition Branch of AFLW and a copy is provided in Appendix D.

The following site selection guidelines should be considered:

1. Select a site which will have minimal impact on crops, vegetation and forests. Try to avoid sites which are being used for crops or grazing; avoid unnecessary removal of trees and damage to topsoil.
2. Sites should not be placed in key wildlife habitat areas (contact Fish and Wildlife Division, AFLW for maps of key wildlife habitats).
3. Refer to the "Fisheries Habitat Protection Guidelines" on well site selection.
4. Consider the final well patterns to minimize right-of-way requirements for roads and lease lines.
5. Consult area residents to discuss possible locations for the lease lines and access roads.
6. Plan the battery or gas well installation configuration to utilize the smallest surface area consistent with safe and prudent operations.
7. Select a site which does not require significant alteration to the local relief. Avoid cuts and fills which pose landslide or slump problems, or cause environmental or aesthetic damage.
8. Consider natural drainage patterns during site selection in order to reduce the number of drainage ditches and culverts required. See Section 5.3.3 for further details on drainage.
9. Determine whether subsurface soil conditions will provide adequate foundation support for the buildings, pump engines and other machinery.
10. Consider the campsite location (see Section 8.6).
11. See Table 5.3 for minimum distance requirements separating new sour gas facilities from residential and other developments.

Information available on site selection, alignment and access consideration includes:

1. **Habitat Enhancement and The Petroleum Industry**

   Information: Document outlines various methods of clearing to enhance wildlife and vegetation. The use of herbicides is also discussed as a part of a vegetation management plan.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721

2. **Fisheries Habitat Guidelines**

   Information: Document outlines guidelines for the protection of watercourses and fish species, and includes such topics as:
   a) well site development and drainage
   b) vehicular access
   c) timing constraints
   d) reservoirs and impoundments.

   Available: Fish and Wildlife Division, AFLW
   phone: (403)427-6734.

3. **Resource Road Planning Guidelines**

   Information: Document outlines the route selection process, plan preparation, alignment and salvage as these relate to access considerations.

   Available: Information Centre, AFLW
   phone: (403)427-3590.

4. **Stream Crossing Guidelines-Operational Guidelines For Industry**

   Information: Document provides environmental practices for planning, construction, maintenance and abandonment of stream crossings on Crown land.

   Available: Information Centre, AFLW
   phone: (403)427-3590.

5.3.2 CLEARING, TIMBER SALVAGE AND DEBRIS DISPOSAL

The Forest and Prairie Protection Regulations and The Timber Management Regulations stipulate the requirements for cutting, clearing and disposal of timber for exploration lines and access routes. The Fire Prevention Act stipulates clearances for industrial operations where fire is involved.

Debris and slash must be disposed of to reduce fire hazards, avoid compromising future uses of the site, maintain aesthetic quality and aid in revegetation and reclamation.

Information available on clearing, timber salvage and debris disposal includes:

1. **The Resource Handbook, Operational Guidelines for Industry**

   Information: Handbook outlines specific guidelines, Acts and regulations as they relate to clearing, timber salvage and debris disposal.

   Available: Information Center, AFLW
   phone: (403)427-3590.

2. **Habitat Enhancement and The Petroleum Industry**

   Information: A description of techniques used in clear cutting to enhance various wildlife habitats.

   Available: Canadian Petroleum Association
   phone: (403)269-6721.

5.3.3 SITE DRAINAGE

Specific guidelines which should be employed at production facility sites to control erosion and drainage off-site include:

1. Natural drainage patterns of the area should be considered when choosing the location of batteries and gas plants.
2. Culverts and drainage ditches must be constructed, as the terrain requires, around the plant site to prevent contamination of surface waters and groundwater. Guidelines for the construction of culverts and drainage ditches are presented in Section 8.5.
3. All product and saltwater storage tanks must be dyked to prevent any spills from spreading and contaminating the surrounding land, surface waters and groundwater. Refer to Section 5.3.6 for specific guidelines for dyked storage areas.
4. Surface drainage in areas of contamination should be segregated from other areas of surface runoff. The contained fluids should be stored for treatment and/or evaporation. It is essential that all contaminated areas be lined with a clay liner or impervious synthetic liner. The proponent should contact Alberta Environment Standards and Approvals Division (427-5885) for information on treatment concepts and requirements.
5. Drainage from dyked storage areas should be contained to prevent leakage of a spilled product from entering into the drainage discharge.

6. Valves used for the drainage of dyked areas should be of the manual, open and close design.
7. The final discharge of all in-plant drainage ditches should be equipped with a return system in case a spill occurs.
8. For standards on allowable surface runoff discharges, the handbook User should refer to Section 8.7.7.3.

5.3.4 WILDLIFE AND HABITAT PROTECTION

Guidelines presented in Chapters 3 and 4 also apply to gas plants, batteries and collection systems. Wildlife should be protected from potential harm by the construction of appropriate fences around the plant itself. In general, the fence should be at least 2 metres high, made of small mesh, and should completely enclose the battery or gas plant.

5.3.5 POLLUTION CONTROL DESIGN REQUIREMENTS

The pollution control design requirements for a battery or gas well installation are given in The Oil and Gas Conservation Regulations (AR 151/71), portions of which are reproduced in Appendix A1. The Regulations specify certain design and safety requirements which must be met in order to prevent pollution of the air, water and soil. Many of these requirements are shown schematically in Figures 5.2 to 5.4.

Tanks, buildings, pits and selected equipment should be located to take advantage of prevailing winds in the event of equipment malfunction or fire. For example, the flare stack should be located away from trees, but downwind of buildings and oil storage tanks. In forested areas, the location and height of flare stacks should be discussed with the area Forest Officer.

For proper environmental design of compressor stations refer to ERCB IL 80-30. It provides information on gas plant compressors, battery compressors, field compression facilities, increased stack height at existing compressors and methods to calculate stack heights.

Information available on Pollution Control Design Requirements includes:

1. **ERCB Interim Directives and Informational Letters**
   IL OG 76-24
   IL 79-16
   IL 80-24
   Available: Energy Resources Conservation Board
   phone: (403) 297-8311.

2. **Courses**
   Conventional Oil Production Facilities (Selection and Design Concepts).
   Available: Petroleum Industry Training Service
   phone: (403) 436-1445 or phone: (403) 250-9606

5.3.6 PRODUCT STORAGE AND HANDLING

Tanks and distribution lines must be located such that they cannot be easily damaged by moving equipment. Design techniques must be employed to prevent pressure eruptions and reduce fire hazard. The Oil and Gas Conservation Regulations (AR 151/71), Sections 8.010 to 8.031 (see Appendix A1), regulate the storage of oil and gas. The main items of these regulations are as follows:

1. No oil shall be stored in pits.
2. No crude bitumen or hydrocarbon derived therefrom shall be stored in a pit without the written approval of the Board.

3. Where pit storage is approved under item 2, the operator shall not commence or continue to use pit storage until the Board or its authorized representative has approved the pit and any necessary fencing or protective installation.
4. Each tank or group of tanks containing oil or any fluid other than fresh water at a battery or processing plant shall be surrounded by a dyke or firewall of a net capacity greater than that of the largest tank within the dyke or firewall, or such greater capacity as the Board may in any case require, and the dyke or firewall shall be maintained in good condition and the dyke or firewall and the area encompassed by it kept free from grass, weeds or other extraneous combustible material, but the Board may suspend any requirement of this subsection in a particular case.
5. Each oil tank or battery of tanks at a well, production battery or processing plant shall be located so that the distance from the outer perimeter of the dyke to any surface improvement other than a public roadway is not less than 60 metres.
6. Notwithstanding item 5, the Board, where in its opinion special circumstances exist, may permit the location of tanks closer to any surface improvement than the distance therein prescribed (AR 151/71; AR 341/74; AR 229/79).
7. Where a pressure relief valve, rupture disk or burst plate is installed on a separator, treater or other pressure vessel which receives production from an oil well, the licensee shall connect the valve, rupture disk or burst plate fitting by suitable piping to an open tank, but the Board, upon application, may allow a licensee to use a system of automatic controls or other method of avoiding oil spills if it is satisfied that the degree of protection provided is equivalent to, or better than, the venting of relief devices to an open tank (AR 241-71).

Information available on product storage and handling includes:

1. **Courses**
   - a) Production Well Technology
   - b) Basic Oil and Gas Operations

   Available: Petroleum Industry Training Service
   phone: (403) 436-1445 or phone: (403) 250-9606

2. **Alberta Public Safety Services, Compliance Guidelines, 1986**

   Information: Guidelines set standards for documentation, markings, handling and transportation of all dangerous goods.

   Available: Alberta Public Safety Services, Dangerous Goods Control
   phone: (403) 427-2772.

5.3.7 WASTE DISPOSAL

This section is based in part on a document entitled "Waste Disposal Guidelines for the Petroleum Industry". This document is available from the Canadian Petroleum Association, phone: (403) 269-6721. In addition the handbook User should review a copy of ERCB IL 85-16 as it provides information on the approval process for oily waste disposal schemes.

5.3.7.1 Oil Based Wastes

Oil production waste materials include:

1. Waste oil sludge
2. Treater hay
3. Oil spill debris.

1. Waste Oil Sludge

Oily waste may originate from several sources. These guidelines address:

a) tank bottoms and treater sludge from conventional production
b) sand and waste oils from heavy oil production
c) pigging wax from line cleaning
d) solvents
e) lube oil.

Oily wastes may contaminate groundwater or could kill vegetation if disposed of carelessly. Burial or dumping of any waste oil in an insecure pit or landfill is an unacceptable practice. Contamination of soils and groundwater can occur and can escape detection for years. The cleanup of such contamination can be very expensive and often unsuccessful.

Waste oil such as sludges and lubricating oils may contain a high concentration of heavy metals. These metals may be released, under acidic conditions, and can pose human and environmental health dangers. Waste oils may also emit odors or could release H_2S.

Tanks should be provided at all facilities to ensure temporary storage for waste oils until they can be properly and safely disposed. Disposal bins equipped with steam tracing lines are available for rental to temporarily store pigging wax. The bin can be transported to a reclaiming facility where it is steamed prior to dumping the residue into a reclamation tank.

The disposal options are as follows:

a) Preferred (optimum waste disposal practices)

The primary emphasis in management of waste oils should be to minimize the volume of material generated and to recover or recycle as much as possible.

(i) Recycle

Whenever possible, waste oil should be recycled back into the production system. Light wax, lube oil and treated slop oil can be pumped into the crude oil pipeline in a controlled manner.

For both environmental and economic reasons, all condensate waste should be recycled through the system.

(ii) Waste oil reclaimers

Waste oil which cannot be recycled within the operating company's facilities should be sent to an approved waste processing and disposal facility. In Alberta, material can be sent to reclaimers that are approved by the ERCB. Industry representatives should periodically meet with reclaimers to discuss any operational problems resulting from the treatment of oilfield wastes.

Pigging wax and solvents that cannot be recycled at company facilities must be sent to a reclaimer.

(iii) Land treatment of sludges

Land treatment is the controlled addition of oily wastes into natural soil. Degradation of the oil by naturally occurring organisms is enhanced by cultivation and addition of soil nutrients, especially nitrogen and phosphorus, and by pH adjustment.

Research is underway to evaluate surface disposal of oil waste sludges. Limitations may be forthcoming in this area from the ERCB Environment Protection Department. Note that land treatment of sludges requires approval under the Clean Water Act.

b) Acceptable (not a permanent solution but generally safe)

(i) Application on Roads (tank bottoms, treater sludge, heavy oils)

Tank bottoms, treater sludge and waste oil from heavy oil operations may be applied to roads, subject to approval from the appropriate authorities. In Alberta approval must be gained from the ERCB, AFLW and the Municipality/County offices if the waste is to be applied on municipal roads.

If the waste is to be disposed of on privately owned land, approvals are required from the ERCB and the landowner. Before the ERCB will issue approval for use of oily waste fluids for road oiling, the following criteria must be satisfied:

- The waste must not contain significant amounts of free saltwater, fracturing acids, or other non-hydrocarbon contaminants, halogenated hydrocarbon, or other manufactured oils.
- The oil in the oily waste must be of a relatively high density.
- An analysis for free water content and chlorides is required.
- Hazardous chemicals and the volumes injected during production must be identified.

An estimated total volume to be disposed of and location of disposal must be provided.

Once the oily waste fluid is approved for disposal, the operator must provide the appropriate ERCB area office (see Figure 2.9) with written consent of the local authority (Municipal District, Improvement District, County, etc.) accepting the waste. Ensuring proper application operations is the responsibility of the local authority. The ERCB suggests that any single application of oily waste fluids be made at a rate of 12 cubic metres per kilometre of road per centimetre of loose aggregate, not to exceed 40 cubic metres per kilometre, and must be done under good weather conditions.

(ii) Incineration

Waste oils can be disposed of by incineration. However, poor combustion (as often occurs in a flare pit) may cause objectionable smoke or odours. Note that incineration of waste oil requires approval under the Clean Air Act.

c) Unacceptable (will lead to pollution problems)

(i) Application of waste oils on dykes

Waste oil such as tank bottom wastes and treater sludges have been applied to dykes in site-specific cases. Approval from the right regulatory authority is required. This method of dyke stabilization may not be acceptable. Most waste oil is too viscous to be properly incorporated into the dyke. It should be noted that those waste oils which can be worked into the dykes are usually of sufficient quality that they can and should be recycled at the facility. Because of the concern about high heavy metal concentrations in some waste oils, recycling is recommended.

The use of pigging wax, lubricating oil or condensate to stabilize dykes is an unacceptable practice.

(ii) Application on roads (wax solvents, lube oils)

The disposal of pigging wax, solvents, lubricating oil or condensate on roads is an unacceptable practice. The physical properties of pigging wax does not allow this waste to be properly incorporated into a road base. Organic compounds in solvents that may be toxic make road application of the waste unacceptable. The presence of heavy metals in lube oils eliminates road application as a viable disposal option.

(iii) Disposal to landfills

Due to the availability of other environmentally acceptable and economically viable options, disposal of waste oils to any landfill should not be necessary. Recent evidence reveals that migration of leachate from many landfills is occurring. Groundwater and subsoil contamination injurious to human health could be increased if hydrocarbon-based materials are disposed in these landfills. If landfill disposal is the only option available to a company, chemical analyses of all materials sent to an industrial landfill should be conducted and kept on file with a completed Waste Manifest Form. In addition, the landfill operator will require information on the waste prior to accepting it for disposal.

Disposal to any municipal landfill, earthen pits or any uncontrolled burial of waste oils is unacceptable and environmentally hazardous. Tank facilities must be established to store waste oils until disposal in a preferred or acceptable manner is possible.

(iv) Open Burning

The open burning of waste oil produced from normal operations is an unacceptable practice. Approval to burn any waste oil must be obtained from appropriate government agencies and is only granted under extreme circumstances.

(v) Unauthorized Discharge on Roads

Any unauthorized discharge of waste oils on roads or adjacent ditches is an unacceptable disposal option.

2. Treater Hay

Treaters are vessels designed to remove impurities from produced crude oil. The most common impurity is water which contains varying amounts of dissolved salts. Other impurities may include sand, metallic oxides, hydrogen sulphide, mercaptans and minerals. In the past, conventional treaters have used gravity separation in conjunction with chemical additives and heaters to achieve the necessary separation of undesirable material from the oil. These treaters also used a filtering medium to further enhance impurity removal. The filter material is called treater hay. Upon removal from the vessel, it is difficult to dispose of for the following reasons:

a) It is difficult and messy to handle.

b) Its high water content makes burning difficult.

c) Many landfill sites, dumps and industrial reclaimers will not accept it.

d) Burning creates unsightly and unacceptable black smoke.

e) It has associated safety problems such as entrained gas (possibly H_2S), absorption by skin, eye irritation, etc.

Survey data collected by the Alberta Environmental Protection Cooperatives indicate that approximately 1000 bales per year were being generated in 1979. The use of treater hay is being phased out. Thermal electric treaters which do not require hay are now being installed at batteries and other oil collection facilities. Even users of conventional treaters are eliminating the treater hay, finding that its use is not effective in many cases.

The disposal options are as follows:

a) Preferred

Prior to removing the hay from the treater, it is recommended to heat the vessel to 80-90^0 for 24 hours. This will result in less residue being left in the vessel and make cleaning more effective.

(i) Approved Incineration

If the contaminated hay can be incinerated in an acceptable manner, this method of disposal is the preferred method

(ii) Industrial Landfill

Waste treater hay can also be disposed of at an industrial landfill site.

b) Acceptable

The following disposal methods are acceptable if the preferred options are not available or economically feasible.

(i) The hay may be disposed of into flare pits and burned in conjunction with periodic flaring (subject to regulatory approval). If the hay is adequately cleaned prior to burning it may not create smoke problems when burning.

(ii) Transport in sealed containers to nearby reclaimers equipped with cleaning facilities and incinerators.

c) Unacceptable

(i) Disposal into uncontrolled dump sites and town dumps

(ii) Disposal onto roads, ditches, forested or other isolated locations.

(iii) On or off lease burial.

(iv) Company operated garbage dumps.

(v) Disposal into ponds, earthen pits or inside dykes.

3. Oil Spill Debris

A 1979 survey by the Prairie Regional Oil Spill Containment and Recovery Advisory Committee suggested that approximately 600 tonnes of oil spill debris are generated annually by the petroleum industry. This debris consists of:

a) oil saturated soil and vegetation

b) oil saturated trees, logs, sticks, stumps, etc.

c) oil saturated snow

d) oil saturated absorbent materials used in cleanup operations.

The prevention of oil spills should be a high priority in all industry operations. Prevention can be achieved by:

a) sound engineering practice

b) corrosion control and monitoring

c) leak detection and automatic shut-down systems

d) personnel training programs.

In spite of all preventative measures, oil spills do happen on occasion. The major objective, in that event, is to recover the maximum amount of product with minimum impact on the enivironment. Recovered product should be sent to reclaimers for cleaning and marketing.

In the past, most spills were controlled on site and burned as quickly as possible. However, due to the emission of unsightly black smoke and the hazard of ash and carbon fallout, regulatory bodies are often reluctant to give permission to burn unless there are no other options. The hazards of forest and/or ground fires must also be considered prior to burning. The heat generated by burning will destroy underground roots and soil microbiology, making re-establishment of vegetation much more difficult.

The disposal options are as follows:

a) Preferred
Because of the problems associated with in situ burning, this cannot be considered the ideal solution. It may be resorted to in some cases, especially in winter or if worker safety is a concern.

After as much oil as possible has been picked up, the preferred reclamation procedure is to help the residual oil to degrade by natural microbial action. This can often be enhanced by using fertilizers and agricultural practice as described in the Petroleum Industry Training Service's "Oil and Salt Spill Site Reclamation" course.

b) Acceptable
The following oil spill containment and cleanup procedures are suggested to minimize the amount of oil spill debris remaining after a spill cleanup. The final debris can be disposed of by natural (or assisted) decomposition or by controlled burning.

(i) Spills in Forest Areas

- Control spill on site by dyking, trenching, etc.
- Recover and pick up as much fluid as possible by vacuum or tank truck. Recycle through production facilities to separate oil and water.
- Wash down spill site with hot water and/or steam to remove as much oil as possible and minimize solid debris.
- During cleanup operations keep physical disturbance of the soil to a minimum.
- Incinerate remaining solid debris by one of the following methods:
  - On-site with government approval
  - On-site in portable smokeless incinerator
  - In reclamation centre incinerator

(ii) Spills on Agricultural Land

- Ensure that the landowner is involved in all aspects of the program.
- Control spill to prevent migration and minimize damage area.
- Recover and pick up as much fluid as possible with vacuum or tank truck. Recycle through production facilities to separate oil and water. Washing down site with hot water or steam may enchance recovery.
- If the remaining mulch of vegetation, bark, soil and oil cannot be treated by land farming, it may be necessary to burn the residue after cleanup, providing approval to burn can be obtained.
- Remove dyking and fill in trenches or bellholes.
- Take samples of soil and spill fluids. Take off-site soil samples for comparison during restoration program.
- Cultivate oil residue into soil, fertilize yearly, or more often if necessary, with nitrogen and phosphorus, and carry out restoration comparable to land farming techniques.
- Monitor and follow-up results of restoration program.
- With the exception of sorbent materials used in cleanup, very little debris should be present. This should be disposed of in the same way as other debris.

(iii) Spills in Muskeg Areas

- Control spill by dyking.

- Dig trenches around spill area to intercept and collect oil. Either pick up oil from trenches by skimmer, or, if approval is obtained, burn oil occasionally as it accumulates in the trenches. Washing with hot water, if possible, may assist in cleanup and recovery. In thick muskeg areas, burning is not recommended because of the potential hazard of ground fires.
- Haul oil saturated vegetation or sorbent materials to a safe area and incinerate as permitted.
- When cleanup is complete remove dykes, fill in trenches and commence restoration program.

(iv) Oil spills in Winter (All Areas)

- Control spill with dykes and trenches.
- Transfer oil contaminated snow to containment pits.
  - As the snow melts in the spring, the site must be carefully monitored for pools of oil under the snow.
  - Oil saturated vegetation, sorbent materials, trees, etc., can frequently be mulched on-site as the basis for restoration.

5.3.7.2 Gas Processing

This section deals with several waste materials which may result from natural gas processing:

1. Holding pond sludges
2. Process filters
3. Spent iron sponge
4. Boiler water/cooling tower blowdown
5. Glycol
6. Dessicants
7. Catalysts
8. Degradation products from amine and sulfinol treating
9. Waste sulphur.

1. Holding Pond Sludges

Depending upon the age of the plant and its design, one or more waste collection ponds may be present on the plant site. Over time, sludges which have accumulated in the ponds must be removed and disposed of in an environmentally acceptable manner. The composition of the sludge will reflect the materials used in the plant process; therefore, sludge composition must first be determined by analysis before disposal options can be recommended.

Over time, process ponds and holding ponds will fill with sludge so the liquid volume is reduced and the pond is no longer effective in allowing sludge to settle out or the pond does not provide enough storage (surge) capacity to handle sudden discharges. The supernatant of the pond may be low in pH, high in heavy metals or otherwise objectionable so that it can only be disposed of downhole subject to regulatory approval. In other cases, the pond overflow must be neutralized or treated to allow discharge to the watershed.

Eventually the ponds must be reclaimed. The sludges which have accumulated (perhaps over several years) could contain a wide variety of compounds which may leach into the groundwater or could affect surrounding soils or vegetation.

Since sludge contains a wide variety of materials, it is not possible to describe specific procedures for ultimate disposal. Sufficient lead time should be built into the disposal plan to allow for sampling and analysis for a broad spectrum of organics, metals and other substances. The results should then be discussed with the appropriate regulatory agencies.

The disposal options are as follows:

a) Preferred

The method utilized for sludge disposal must be determined for each specific sludge, and must involve testing and, perhaps, research trials. Therefore none of the procedures are considered to be "preferred". Proper preliminary analytical work should lead to an acceptable land application specifically tailored to that location.

b) Acceptable

There are essentially two acceptable disposal options: land application or industrial landfilling.

In some cases, the sludge which remains in the bottom of a pond after dewatering may be best left where it is. If the pond is impermeable, depending on the analysis of the sludge, it may be acceptable to allow the sludge to dry in place and cover with earth fill. The surrounding groundwater should be monitored regularly and records kept in the plant plot plan of its location and the nature of the buried material. This procedure will require permission from Alberta Environment for on-site burial.

Sludges which are high in certain organics and organic salts (including hydrocarbons) but relatively low in heavy metals may be good candidates for sludge farming or spreading on roads. Sludges which have high metal contamination and low organic and nutrient levels will probably have to be disposed of in an industrial landfill.

An industrial landfill is engineered after careful consideration of the following:

(i) hydrogeology of the site
(ii) permeability of available construction materials
(iii) the need for impermeable clay and/or synthetic liners
(iv) site restrictions
(v) operating requirements
(vi) monitoring and reporting requirements

c) Unacceptable

Any procedure which allows contaminated supernatant or sludge to escape to the watershed or the surrounding vegetation in an uncontrolled manner is unacceptable.

Futher information on holding pond sludges is as follows:

1. **Gas Plant Sludge Characterization Pilot Program**

   Information: Document evaluates sampling and analytical procedures for holding pond sludges.
   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

2. **Gas Plant Sludge Characterization: An Information Review**

   Information: Document provides an information review for characterizing gas plant sludges.
   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

2. Process Filters

There are many types of filters used in the petroleum industry. They include glycol filters, lube oil filters, domestic water filters, amine and sulfinol filters, etc. Eventually these filters become clogged and must be replaced. Since the filter media will be saturated with the material being filtered, care must be taken when disposing of them. Dumping the old filters in a pit may lead to soil or groundwater contamination. Burning in a flare pit will cause smoke problems.

The disposal procedure for filters depends on the characteristics of the substance being filtered. These procedures apply to filters with oil substances such as lube oil, sulfinol, amine, glycol and liquid fuel filters. Filters such as water filters, which may not contain problem materials, can usually be handled like normal garbage and disposed of at the appropriate dump site.

The disposal options are as follows:

a) Preferred

Immediately after use, filters should be stored in a container equipped with screens to permit fluids to drain. The resulting fluid should then be either re-injected into the producing system or sent to a disposal well.

Drained filters should be taken to a disposal facility equipped with an approved incinerator. Residue from incineration can be disposed of at an approved landfill site.

While handling these filters it is important to avoid prolonged or repeated skin contact. Impervious gloves should be worn, and all clothing worn while disposing of the filters should be laundered frequently.

The storage area should be well ventilated and distant from all buildings.

b) Acceptable

If a screened on-site container is not available for drainage, a barrel with a fitted screen may be used. Following drainage, if incineration is not possible at an approved site, the filters should be enclosed in separate plastic bags, sealed in a drum and buried at an industrial landfill site.

c) Unacceptable

Following are some unacceptable options for the disposal of filters:

(i) Unsecure landfill sites
(ii) Discarded into open pits, on or off lease
(iii) Burial on or off lease
(iv) Discarded in public areas.

3. Spent Iron Sponge

Iron sponge, which is wood shavings impregnated with hydrated iron oxide, is used to remove low levels of H_2S from natural gas. The reaction is as follows:

$Fe_2O_3 .nH_2O + 3H_2S \text{-->} Fe_2S_3 + (3+n) H_2O$ (ferric sulphide)

The sour gas is passed through vessels loosely packed with iron sponge. The sponge is "spent" when H_2S breakthrough is detected in the outlet. It can be either regenerated with air to form elemental sulphur or it can be removed and disposed. Further information on the disposal of iron sponge and the H_2S removal process can be found in Section 5.3.8 - Sulphur Handling.

4. Cooling Tower Blowdown

Process cooling can be achieved using air cooling or water cooling. Air coolers are often large and have low to medium noise emissions. Water cooling is normally required at large heat duty facilities. Process rationalization of air or water cooling will depend partly on the availability of water in sufficient quality and quantity, and the potential for offstream water storage requirement.

Cooling tower blowdown water contains suspended solids, concentrated salts, metal oxides, corrosion inhibitors that may be chromate or zinc based, and, in some cases, dispersants and microbiological control agents such as chlorine and slimicides.

If chromate or zinc based corrosion inhibitors are used, high levels of the metals will be concentrated in blowdown waters. The conventional chromate removal process produces a significant volume of sludge that must be stored securely in separate storage ponds, representing disposal problems at undetermined future costs.

Cooling water blowdown can be filtered and, if compatible with the geological formation, disposed of in a deep well. If the disposal well is also used for process waste, these streams should be tested to determine their compatibility with each other and the formation. Chrome and zinc based blowdown should not be added to a biological treatment pond due to the toxic effect of these metals on the bacteria.

The disposal options are as follows:

a) Preferred

Although chromate is the best known aqueous corrosion inhibitor, nitrate, molybdate, tungstate and organopolyphosphate systems are also useful and should be considered since they may not present the same disposal problems associated with chromate. Organopolyphosphate treatment has the definite biological advantages of being less toxic and not bioaccumulated. Significant experience has been obtained in eastern Canada using this type of system.

Preferred disposal of chromate or zinc system blowdown (if this is the only cooling water process acceptable) is to utilize deep well disposal into a formation whose characteristics are compatible with the chromate waste water.

If chromate zinc based inhibitors are a necessity, the Ion Exchange Process could be applied to selectively remove chromate by exchange with chloride, sulphate or hydroxide ion resins. The overall operational cost for a weak base process depends greatly on resin life. The value of recovered chromate, when reused as the cooling tower system corrosion inhibitor, can offset the operating cost.

The system will not remove trivalent chromium or zinc. A cation exchange unit can be superimposed on the system to remove these elements from blowdown for discharge purposes.

One big advantage to the ion exchange process in comparison to the chemical reduction process is that there is no sludge to handle. In addition, fluid streams, such as rinse and backwater, can be returned to the cooling tower for reuse.

b) Acceptable

The two-step chemical reduction process characteristically generates a significant volume of difficult-to-dispose-of sludge. The hexavalent chromate ion is reduced to the trivalent chromium ion in the first stage. In the second stage, the trivalent chromium ion is precipitated as chromium hydroxide.

c) Unacceptable

Chromate or zinc based cooling treater blowdown must not be discharged to surface waters.

Cooling water blowdown from organophosphate based systems that meet the regulatory requirements for surface water disposal can have a noticeable aesthetic impact on a small receiving stream due to the turbidity and the warmer temperature. This can result in prevention of ice formation and fog in the winter and additional algal growth in the summer.

Discharge using a subsurface diffuser might be considered if aesthetics are of concern.

5. Glycols

Although glycols are used in several ways in the petroleum industry, they are not a major source of waste. Accidental spillage, however, is an ever-present threat.

Triethylene Glycol (TEG), Diethylene Glycol (DEG) and Ethylene Glycol (EG) are the most common liquid dessicants used in the gas industry. Of these, TEG is the most common because it is less prone to vapour losses. Since glycols used for this purpose are regenerated and recycled by a continuous process in a closed system, they are only released to the environment to any significant degree as a result of spillage.

In addition to vapourization losses, other losses include spillage and those resulting from foaming in the absorber or regenerator. To prevent pH reduction of glycols and hence to retard chemical decomposition, small amounts of bases, such as triethanolamine, borax or sodium mercaptobenzothiazole, are added. Other possible contaminants in glycols, lost from the processing system, are saline water (brines), hydrogen sulphide and carbon dioxide.

Because of their heat transfer characteristics, low freezing point and high boiling point, glycols are used extensively for both heating and cooling. Some gas pipelines include a small diameter glycol pipeline in the same trench to heat the gas. Similarly, many cooling systems use water/glycol solutions. The most common are liquid cooled engines (e.g. compressors) and liquid cooling towers. Again, being closed systems, losses other than accidental are minimal.

The disposal options are as follows:

a) Preferred

Deep Well Injection
Glycols should be segregated from other wastes and reused. Glycols from spillage are usually disposed of by washing to an on-site containment pit, together with other organic compound spillages, followed by injection into a disposal well. (See Section 8.7)

b) Acceptable

(i) Land Application

Provided suitable land is available, dilute glycol solutions (maximum 1000 ppm) from storage pits could be used for irrigation. This method is particularly attractive if deep well injection is not possible because there is no suitable well available or there is an incompatibility between this wastewater and other fluids, or conventional wastewater treatment systems are incapable of treating the waste adequately or economically to a degree that allows surface discharge.

Land application techniques are in some cases inadvisable or impossible, particularly if the wastewater is saline. In the case of glycol wastewaters, the presence of brines could render this method unsuitable if the concentration of the glycol in the wastewater is too high.

Irrigation with wastewater containing glycols and other gas plant wastes including amines and, in some cases, tetramethylene sulfane (Sulfinol) has been conducted in Alberta. Examples include Shell Waterton, Shell Jumping Pound, Esso Quirk Creek and Canterra Ram River. Sites irrigated have included pasture, forages and a Lodgepole pine forest ecosystem. Published reports or information on these irrigation projects are available from Alberta Environment (Earth Sciences Division, Lethbridge).

Glycols added to soil at low application rates will be readily degraded by a large number of heterotrophic organisms. The fate of glycols in an aerobic soil will be similar to alcohols and result in oxidation products of CO_2 and H_2O. As with other non-refractory hydrocarbons, addition to soil will result in a drain on the nutrient pool, particularly available nitrogen and phosphorus. These should therefore be added to the glycol treated area at a rate designed to maintain C/N and C/P ratios similar to those of the untreated soil.

(ii) Incineration

Provided due consideration is given to gaseous emissions in compliance with air quality standards, glycols may be disposed of by incineration. Glycols per se would oxidize to CO_2 and H_2O. Potential contaminants in the glycol such as sulphur would result in small amounts of SO_2 being emitted to the atmosphere.

c) Unacceptable

(i) Discharge to Creeks or Surface Waters

Direct discharge of untreated glycols to creeks or other surface waters is unacceptable because this could lead to degradation of these compounds by aquatic organisms. The resulting reduction in dissolved O_2 could kill fish. Furthermore, since some glycols used in plant processes are likely to be sour (contain H_2S) a direct fish toxicity problem may occur. Brines, if present, would result in deterioration of water quality by increasing undesirable salts.

(ii) Uncontrolled discharge to surface soils.

6. Dessicants

The two most commonly used dry dessicants are molecular sieves and silica gel/silica-alumina beads.

Molecular sieves are a crystalline form of sodiumaluminasilicate. They are used for the removal of water, mercaptans and trace amounts of COS, CS_2, H_2S and CO_2 . The order of adsorption is water, mercaptans, hydrogen sulphide and carbon dioxide. Molecular sieves do not adsorb heavy hydrocarbons but during use could become contaminated by oil or glycol.

Molecular sieves are used in instrument air dryers for the removal of water, LPG systems to remove water and mercaptans, and treaters to remove H_2S and CO_2 .

Since molecular sieves are regenerated, the changeout frequency is very low (e.g. usually four to five years and as long as eight to ten years). Regeneration keeps the molecular sieve very clean. Also, quantities to be disposed of are not very large (300 - 1000 kg per container) and much smaller than that of the catalyst.

Silica gel and silica-alumina beads are slightly acidic materials that are used to remove water from natural gas. They also adsorb heavy hydrocarbons but release them more easily in regeneration than other dessicants. Silica gel is very similar to molecular sieves in function, quantity and life span.

The disposal options are as follows:

a) Preferred

(i) Landfill

Since molecular sieves are alkaline and often quite clean from the regeneration process, they can safely be disposed in properly constructed landfills at the plant site. The burial location should be away from the sulphur block (see Section 5.3.8.) since the low pH of sulphur block runoff may mobilize active metal ions on the dessicant. Since molecular sieves are only slightly soluble, they will have no effect on the pH of the environment in which they are placed.

Silica gel can be disposed of in a landfill or buried on site. Since silica gel is only slightly soluble and very weakly dissociated, this material will not affect the pH of the soil.

(ii) Industrial Landfill

Contaminated molecular sieves (with oil, glycol or heavy hydrocarbons) should not be landfilled. They must be stored in drums or on the plant site. Since the quantity is often not very large this is not a problem for most plants. In most cases, the degree of contamination does not warrant this method of disposal.

(iii) Alternate Industrial Uses

It may also be possible to find alternate secondary uses for spent silica gel such as in concrete or road paving materials. Some molecular sieves can be sold for recovery of the contained metals (e.g. cobalt and molybdenum).

b) Acceptable

See methods above.

c) Unacceptable

Uncontrolled burial or dumping is not acceptable.

7. Catalysts

Catalysts are used in the converter beds of modified Claus sulphur recovery plants to enhance the reaction of :

$$2H_2S + SO_2 \dashrightarrow 3(nS_n) + 2H_2O$$

There are several kinds of catalyst but activated alumina is used in the majority of sulphur plants in Alberta. Other types of catalyst are activated bauxite, cobalt molybdenum catalyst, vanadium oxide catalyst, lanthanum oxide-based catalyst and titanium dioxide catalyst. These guidelines will deal primarily with activated alumina.

The converters at a sulphur plant may contain up to 800 tonnes of catalyst. The changeout frequency varies from one year to five years depending on the catalyst and sulphur plant efficiency requirements. Operational upsets can lead to premature catalyst changeout.

a) Activated Alumina

Alumina is alkaline and essentially insoluble with water. Physically it is a white odorless solid in the shape of grains or spheres. A typical composition is as follows:

	Percent on Dry Basis
SiO_2	0.02
Fe_2O_3	0.02
Na_2O	0.35
Loss on Ignition	6.00
Al_2O_3	93.60

In the modified Claus process, catalyst is in contact with N_2, SO_2, H_2S, COS, CS_2, H_2O, and CO_2. Activated alumina can be poisoned with sulphur, sulphates, carbon and diethanolamine which greatly reduce the activity of the catalyst. When catalyst is contaminated, it can be regenerated by increasing the converter bed temperatures and completing a burnout. This procedure for decontaminating catalyst can be done several times during the life of the catalyst. Before shutdown, a proper regeneration of the catalyst beds minimizes the amount of sulphur and other contaminants associated with the activated alumina.

b) Activated Bauxite

The guidelines for activated bauxite are identical to that of activated alumina catalyst. Activated bauxite, which was used more widely in the past, is being replaced with activated alumina.

The disposal options are as follows:

a) Preferred

(i) Alternate Industrial Uses

Catalyst can be used in the manufacture of abrasives such as sandpaper, however, this industry only uses a small percentage of the spent catalyst available. Catalyst could possibly be used in light-weight concrete products or road paving materials.

(ii) Return to Suppliers

The preferred disposal method of catalysts other than activated alumina or bauxite is to return the catalyst to the vendor to recycle.

b) Acceptable

(i) Landfill

Spent catalyst which has not been heavily contaminated with sulphur compounds should be buried in a separate landfill by itself. The burial pit should be located away from the sulphur block (see Section 5.3.8). Burial of catalyst in a calcareous material of loam or clay loam texture with a buffer zone of one or two metres above the water table would certainly be adequate. This could be done on the plant site or other suitable location.

These catalysts can also be landfilled providing the same measures are taken as outlined for activated alumina catalyst. V, La and TiO_2 are virtually insoluble in neutral and alkaline environments. Molybdanite solubility increases with pH but is not very soluble at pH 8-8.5.

Catalyst that is heavily contaminated with sulphur compounds does have some potential for acidification even in calcareous material. However, if it is landfilled with lime ($CaCO_3$), there will be no problem since Al^{+3} is very sparingly soluble and virtually immobile in a slightly alkaline environment.

c) Unacceptable

Catalyst should not be spread on gravel roads. Spreading alumina catalyst on roads is unsightly and causes dust. In addition, entrained sulphur can cause acidic water runoff problems.

8. Degradation Products from Amine and Sulfinol Treating

In the course of the absorptive sweetening of natural gas by intimate contact with amine-based aqueous solutions, the amine components (MEA, DEA, DIPA, etc.) may react with impurities in the gas to form nonregenerable or hard-to-regenerate compounds which are generally referred to as degradation products. A sidestream of the circulating amine solution is directed to a reclaimer which, using heat, concentrates the degradation products as a sludge in the reclaimer vessel.

Besides containing quantities of the parent amines and water, the following components may be present in the reclaimer sludges (depending on the contaminants in the gas stream and the particular amine(s) in solution):

a) Oxazolidone-2

b) 3-(2-Hydroxyethyl) oxazolidone-2

c) N-(2-Hydroxyethyl) ethylene diamine

d) NN^1 -Di-(2 Hydroxyethyl) piperazine

e) 1-(2-Hydroxyethyl) imidazolidone-2

f) DIPA oxazolidone

Appropriate handling procedures should be developed with both the concentrations and the toxicology of the components in mind. Current practices include the use of protective clothing and storage in sealed steel drums.

The disposal options are as follows:

a) Preferred

(i) Incineration

Some research has been completed by private companies, such as Shell Canada Resources Ltd., into the incinerability of amine degradation products. In general, the results of the incineration tests are favourable.

The few installations that use this disposal method route the reclaimer bottoms to the sulphur plant incinerator via traced and insulated pipe, either through a blowcase or directly off the reclaimer at a controlled flow rate. Experience has shown that atomization at the burner tip is essential for effective combustion. In the evaluation of incineration as an alternative, it is suggested that Alberta Environment, Air Quality Branch, be consulted to assess the viability of the disposal of the particular sludge.

b) Acceptable

(i) Landfill

Depending on the viscosity of the sludge at ambient temperatures, fixation using a suitable medium such as fly ash may be necessary. This is predominantly the case with sludges resulting from the use of MEA, DEA or TEA. The sludge produced from the sulfinol solution, however, is generally below its pour point at ambient temperatures and fixation is normally not required.

The stabilized material should be contained in sealed steel drums and shipped for burial at an industrial landfill site which has been licenced by the regulating government body for the receipt of this waste. Alberta Environmental Industrial Waste Branch should be contacted.

c) Unacceptable

Road spreading, burial and uncontrolled dumping are not acceptable disposal options.

9. Waste Sulphur

A major by-product from sour gas production is elemental sulphur. Waste disposal problems related to sulphur arise from sulphur contaminated with soil (sulphur block base pad) or soil contaminated with sulphur (sulphur dust).

Surface runoff water from sulphur storage is highly acidic. This can result in pH problems with surface water or groundwater and may increase the mobility of heavy metals in the soil. Section 5.3.8 deals specifically with sulphur handling.

Information available on waste disposal can be obtained from the following documents:

1. **Waste Disposal Guidelines for the Petroleum Industry**

   Information: Guidelines for the disposal of petroleum industry wastes.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

2. **Waste Disposal Guidelines**

   Information: Discusses the options for disposal of waste from heavy oil operations.

   Available: Sask-Alta Waste Disposal Cooperative Husky Oil Operations Ltd.
   phone: (403) 825-1196.

5.3.8 SULPHUR HANDLING

The handbook User should obtain a document entitled Sulphur Handling Guide (1983) prepared by the Canadian Petroleum Association.

The major issues with sulphur handling are:

1. The potential human hazards which include:
   a) the high temperatures used when handling liquid sulphur (e.g. 230° to 150°);
   b) dissolved gases such as sulphur dioxide, hydrogen sulphide and hydrogen polysulphide;

    c) the "hot tub" phenomenon which occurs when molten sulphur is poured on a sulphur block and a deep pool of molten sulphur results with a crust on top. Personnel could step on the crust and break through to the molten sulphur.

2. Sulphur dust producing sulphuric acid when it reacts with water, certain organisms and most soils. This reaction is a major cause of vegetation damage.
3. Sulphur spills may occur when pouring molten sulphur into tank cars for transportation or onto sulphur blocks for storage.
4. Handling runoff and drainage from sulphur storage areas.
5. Reclamation of sulphur contaminated soils. Every time a sulphur spill occurs, all of the sulphur cannot be reclaimed and as a result, the soil is impacted by
    a) lower pH
    b) loss of base cations
    c) mobilization/dissolution of aluminum, manganese and iron (aluminum and manganese are toxic to plants)
    d) disruption of the soil's "biotic" community.

To alleviate these hazards or mitigate their impacts, the following guidelines are suggested:

1. When pouring liquid sulphur into tank cars, reduce the chance of spills by ensuring the loading spout is chained down or secured to prevent the spout from lifting up when the flow starts. A splash plate on the end of the spout will reduce the upward reaction force.
2. When storing sulphur blocks:
    a) ensure that the blocks are oriented with the long axis parallel to the prevailing wind direction;
    b) provide facilities for reclamation to take place downwind;
    c) consider the soil bearing load and water table level when selecting the block site and block weight;
    d) provide an impervious drainage system around the block to collect runoff.
3. When undertaking sulphur recovery the preferred method is by in situ melting as there is minimum dust formation. In addition, collection and treatment of vapours produced during remelting operations should be considered depending on location, proximity to populated centers and other factors. (Contact Air Quality Control Branch, Alberta Environment for further information.)
4. In addition, to reduce dust formation and spreading:
    a) water roadways on the block (but control runoff);
    b) shut down sulphur breaking operations when the wind velocity exceeds the transporting velocity of the minimum particle size normally encountered;
    c) where practical, pour a fresh layer of molten sulphur over broken sulphur surfaces to seal the sulphur dust.
5. Formed sulphur should be stored in sheltered vats with good drainage systems and windbreaks upwind of the vats.
6. When loading rail cars, ensure that the rail cars are not leaking.
7. Sulphur block runoff water must be controlled. The following are recommended:
    a) Placement of new blocks should be based on careful study of local conditions.
        (i) New storage areas should be located on high ground where the moisture content of the soils is low.
        (ii) The groundwater elevation should be determined, and should be well below surface so that compression of the soils by the sulphur block weight will not result in interception of the water table.

    - (iii) Areas that have pervious soils should be avoided, as should areas where groundwater discharges (springs) occur.
    - (iv) The blocks should not interfere with natural drainage.
  - b) The volume of water requiring handling should be minimized.
    - (i) The holding pond for acidic water should receive only that water resulting from precipitation drained from the area of sulphur storage and should not receive water from any adjacent areas.
    - (ii) Mixing of acidic water with other water, if necessary, should take place following treatment of the acidic water to the level necessary for the disposal method.
    - (iii) If downhole disposal is implemented, a separate well for acid runoff drainage may be required, unless it is shown to be compatible with other fluids that are being injected.
  - c) The residence time of water under and around the sulphur storage blocks should be minimized.
    - (i) The storage base should be compacted to avoid settling, and sloped slightly to improve drainage.
    - (ii) Drainage from the block area may be enhanced by placing a gravel pad or weeping tile system around and under the block.
  - d) The area of sulphur contact with soil and water should be minimized.
    - (i) Treatment or containment should be as close as possible to the storage blocks, to minimize both soil/water contact, and the influx of other runoff water.
    - (ii) The lining of drainage ditches with, for example, lump calcium carbonate, clay, or concrete, or transmission of runoff water by plastic pipe will significantly reduce the contact area.
    - (iii) Good housekeeping, including avoidance and immediate cleanup of liquid sulphur spills and broken sulphur, will help reduce the contact of sulphur with soil and water.
  - (e) Water holding, handling and treatment systems should be designed based on a thorough and accurate assessment of local climactic, soil and groundwater conditions, and should be carefully managed.
  - (f) Percolation of water with low pH and heavy metal content is not an acceptable method of disposal.

8. Sulphur contaminated soils must be reclaimed.

   The normal method is by the addition of lime to correct the soil pH and produce gypsum as a by-product, which has little effect on the soil.

   The important chemical variables to determine in sulphur dusted areas are pH, total sulphur, elemental sulphur, soil bulk density, electric conductivity and cation exchange capacity. Methods currently available to determine elemental sulphur in soils are fraught with difficulty and it is therefore recommended that total sulphur be determined. Total sulphur includes elemental, organic and inorganic sulphur (SO_4).

   Detailed calculations based on the soil analysis are necessary to determine the amount of lime required. The procedure for these calculations are given in the "Sulphur Handling Guide" available from the Canadian Petroleum Association.

   A "rule of thumb" for lime application is as follows:

Soil Texture	Lime Required (t/ha) to raise pH by one unit per 15 cm depth
coarse	2.5
medium	4.0
fine	5.5

These application rates are reasonable if the pH is in the range of 4.5 to 6.5. If it is less than 4.5 then the rates should be doubled.

9. Sulphur contaminated wastes must be disposed of in a proper manner. Sour gas sweetening with iron sponge or ironite slurry produces a waste product containing pyrite (FeS_2), troilite (FeS) and sulphur (S). A similar process based on sweetening sour gas with an inorganic zinc compound generates zinc sulphide.

   Spent catalyst from the modified Claus sulphur recovery process contains sulphates, sulphides and free sulphur.

   Disposal by burial or cultivation on the land is acceptable provided that steps are taken to neutralize the acids which are produced by biologically induced conversion of the sulphur in the soil. The following two options are available:

   a) Pit Burial

      This relatively simple disposal method is applicable to all sulphur contaminated wastes, however, watery waste must be pretreated to a reasonably dry state.

      The method consists of excavating a suitably sized pit above the water table, in an area underlain by clay or silt. The bottom and sides of the pit are then to be lined uniformly with limestone. The amount of limestone to be used will depend on the amount of sulphur in the waste. Each kilogram of sulphur requires 3.2 kilograms of limestone.

      After lining the pit with limestone, the waste is deposited in the pit, covered with a layer of limestone in an amount equal to 10% of the amount used to line the pit and a final earth cover put in place. The top of the waste is to be at least one metre below the finished grade. Final surface grading should eliminate accumulation of surface water at the disposal site.

   b) Surface Disposal

      This method consists of applying the sulphur contaminated solid waste evenly across an area of land at a maximum rate of 2 tonnes of sulphur per acre. Either prior to or immediately following an application of the waste to a disposal area, the calculated amount of $CaCO_3$ (ground limestone) or $Ca(OH)_2$ (hydrated lime) should be spread evenly over this area of disposal to achieve pH control.

      Using suitable tillage equipment, the waste and lime or limestone must be incorporated into the soil immediately after spreading.

   When a small amount of sulphur contaminated solid waste is generated periodically the same area may be used for disposal a number of times before reaching a maximum 2 tonnes of sulphur per acre.

   The disposal area should be used in a 3 or 4 year cycle, disposing of up to 2 tonnes of sulphur per acre on a given area every third or fourth year. During the years between disposal, the area should be either sown to a grass mixture or farmed in some way (should support vegetation). A regular soil sampling program should then be followed to ensure pH control.

   Disposal via this method is not recommended during the winter as the potential for surface water contamination is significant since incorporation into the soil is not possible.

Information available for sulphur handling and sulphur contaminated wastes are:

1. **Sulphur Handling Guide, 1983**

   Information: Outlines potential hazards, block storage and block reclamation.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

2. **Guidelines For The Disposal of Sulphur Containing Solid Wastes**

   Information: Document outlines pit burial and surface disposal methods of handling sulphur. Also, information is included on the effects of sulphur on soil.

   Available: Standards and Approvals Division, Alberta Environment
   phone: (403) 427-5883.

3. **IL 84-11 Approval, Monitoring, and Control of Sulphur Storage Sites**
Available: Energy Resources Conservation Board
phone: (403) 297-8311.

5.3.9. GASEOUS EMISSIONS

Figures 5.2 and 5.3 indicate where gaseous emissions might occur in an oil production battery or gas plant. Control of gaseous emissions and flaring is required under the Oil and Gas Conservation Regulation, AR 151/71, and is covered in Sections 7.040 to 7.070 of that Regulation (see Appendix A1). In addition, the Clean Air Act controls the air quality and limiting emission quality.

The main air quality parameters of concern for production facilities are SO_2, H_2S and NO_x. Ozone, carbon monoxide, hydrocarbons and ammonia are also a concern.

Air Monitoring Directive (AMD86-1) has been prepared in draft form. The directive is designed to specify and standardize acceptable pollutant monitoring methods and reporting formats.

Gaseous emissions from sour gas plants in Alberta are primarily in the form of SO_2 at rates of a few to 100 tonnes/d, depending primarily on H_2S inlet rate, plant size and sulphur recovery efficiency. Fugitive H_2S is emitted in quantities which are insignificant in comparison to the SO_2 emissions. NO_x emissions can be significant if there are compressors driven by internal combustion engines.

Deposition patterns from gaseous sources, predicted by atmospheric diffusion modelling, indicate that sulphur deposition from a gas plant will occur a few kilometers downwind at varying rates depending on the emission rate, stack height and temperature. The size of the area receiving maximum depositions is usually predicted to be in the order of a few hundred hectares.

The AMD is in draft form and as a result cannot be referenced in detail. The information contained in these directives defines monitoring and reporting requirements. In addition, details are provided for items such as:

1. standard site criteria for monitoring
2. documentation
3. total sulphation calculations
4. hydrogen sulphide calculations
5. water soluble fluoride calculations
6. dustfall calculations
7. soil pH monitoring procedures
8. high volume sampling procedures
9. vegetation fluoride analysis
10. quality assurance procedures
11. heavy metals analysis
12. source emission survey report format.

The ambient air quality objectives are defined in Table 5.2. These are the objectives that the plant operator must comply with.

Another consideration with gaseous emissions is the public concern over the health risk of living near a sour gas well. Table 5.3 provides a summary of minimum distance requirements separating sour gas wells from residential and other developments. Separation distance requirements for other sour gas facilities (e.g. pipelines) are currently being prepared by the ERCB.

The handbook User should also be aware that the Oil and Gas Conservation Regulations require:

> **Emergency venting equipment such as pressure relief valves, rupture disks and burst plates must be installed on separators, dehydrators, pressure vessels, storage tanks and other related equipment. The emergency venting must be connected to the flare stack to ensure complete oxidation of all gaseous substances prior to their discharge to the atmosphere.**

Additional information on equipment venting is given in "Recommended Practice for Setting, Connecting, Maintenance and Operation of Lease Tanks" (API 1981).

For stack height calculations on all compressors, the handbook User is refered to ERCB IL 80-30.

Further information on gaseous emissions is as follows:

1. **Researching Acid Depositions: Workshop Proposals**

   Information: Document outlines research plans on Air Quality Studies and other environmental studies.
   Specific issues are highlighted including monitoring techniques.

   Available: Acid Deposition Research Program
   phone: (403) 269-6721.

2. **Nitrogen Oxides Emission for Alberta**

   Information: Document outlines a series of tables and charts depicting NO_x emissions from several major sources and records emission levels.

   Available: Pollution Control Division, Alberta Environment
   phone: (403) 427-5893.

3. **Alberta Oxides of Nitrogen Emissions Forecast 1980 to 2000**

   Information: Growth forecast of NO_x emission in Alberta from major emitors.

   Available: Research Management Division, Alberta Environment
   phone: (403) 427-3943.

4. **NO_x Control Technology for Compressor Engines in Alberta**

   Information: Assesses the feasibility of reducing NO_x emissions from compressor engines used in the oil and gas industry in Alberta.

   Available: Acid Deposition Research Program, Canadian Petroleum Association
   phone: (403) 269-6721.

5. **A Review of Corrosion with Reference to Rural Alberta**

   Information: Assesses rates of corrosion in rural Alberta for fencing and machinery.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

6. **Courses offered by the Petroleum Industry Training Service**

   Courses:
   a) Gas Technology
   b) Gas Compressor Operating School
   c) Environmental Management in the Sour Gas Industry
   d) Reciprocating Compressor and Engine Maintenance and Repair Workshop
   e) H_2S Alert
   f) H_2S Instructor Certificate

   Available: Head Office,
   phone: (403) 250-9606
   Branch Office,
   phone: (403) 436-1445.

7. **Air Monitoring Directive AMD 86-1, Alberta Environment**

   Information: Monitoring and reporting procedures for industry.

   Available: Pollution Control Division, Alberta Enviroment
   phone: (403) 427-5893.

8. **Guidelines for Preparation of Sour Gas Emergency Procedures Plans for Sour Gas Facilities**

   Information: Document outlines the preparation and contents of an emergency plan.

   Available: Canadian Petroleum Association,
   phone: (403) 269-6721.

9. **Rural Air Quality Monitoring Computer File**

Information: Ongoing file documents dust fall, hydrogen sulphide, sulphation and flouride levels in rural Alberta.

Available: Pollution Control Division, Alberta Environment
phone: (403) 427-5893.

10. **Guidelines for Plume Dispersion Calculations**

Information: Calculation of stack height, standard site concept and prescribed methods.

Available: Alberta Environment, Standards and Approvals Division
phone: (403) 427-5883.

11. **Environmental Effects of Sulphur Extraction Gas Plants in Alberta**

Information: A collection of bulletins, proceedings, reports, and recommendations on environmental impacts of sulphur extraction gas plants.

Available: Environment Council of Alberta
phone: (403) 427-5811.

12. **Urban Air Quality Monitoring Computer File**

Information: Ongoing file documents nitrogen oxides, carbon monoxide, sulphur dioxide and others for the urban centres of Calgary and Edmonton.

Available: Pollution Control Division, Alberta Environment
phone: (403) 427-5893.

5.3.10 WATERFLOODS

In undertaking waterfloods, the main environmental concern is the development and use of water supply. While it is recognized that each waterflood project is site-specific, many potential problems can be avoided by following some common guideline principles. The legislation governing water usage and water quality is the Water Resources Act, the Groundwater Development Act and Regulations, and the Clean Water Act (see Appendix A1).

The decision by the regulatory agency to licence a project, and the terms and conditions attached to the licence will be based not only on the technical merits of the application, but also on the reaction of the public to the proposed water supply scheme.

The use of water in Alberta is controlled and regulated by various legislative acts, policies and regulations. The process for regulating use has been demonstrated by several thousand existing licences and permits to be effective in protecting the public interest and is fair to water users.

Under the Water Resource Act of 1970 and its subsequent amendments, the ownership of all water in the Province of Alberta resides with the Crown and cannot be diverted and used without prior approval.

Prior right to divert and use water under the Water Resources Act is given in accordance with the date of application for licence. Prior right notwithstanding, the preferential order of water use as identified in the Water Resources Act is:

1. domestic purposes
2. municipal purposes
3. irrigation and other agricultural purposes
4. industrial purposes
5. water power purposes
6. other like purposes.

Any company proposing to use groundwater or surface water for non-domestic purposes must obtain authorization from Alberta Environment in the form of a licence or temporary permit.

The applicant should begin by applying for and obtaining an exploration permit since it is necessary to comply with the terms of an exploration permit before formal application to use groundwater can be made.

The terms of the exploration permit outline technical information, such as pumping test data, which must be included in the application.

It is the responsibility of the applicant to demonstrate that sufficient groundwater is available for the project and that diversion of the required amount of groundwater will not have an unreasonable effect on wells in the surrounding area.

To minimize the risks of delay in project implementation, it is recommended that a formal preliminary assessment of water supply alternatives be undertaken well in advance of the detailed design and evaluation. The Phase I Preliminary Assessment of Water Supply Alternatives should consider the following elements:

1. Formulation of Demand Curve

   At a very early stage in the development of the project, it is important to establish a provisional water demand curve. For waterflood projects, the water demand is commonly:

   Total Water Injected = Produced Water + Make-up Water

   It is the "make-up" water that must be licenced by Alberta Environment.

2. Project Timing

   The time required to develop and licence a water source may vary from a few weeks to more than 2 years, depending on a number of factors.

3. Technical Considerations

   The Phase I assessment should consider all potential water sources and scenarios within the project area that could conceivably be developed.

4. Social and Environmental Impact
5. Economics and Cost Comparison
6. Criteria for Selection of Methodology for Secondary Recovery
7. Benefit Received From Secondary Recovery Project.

The decision as to which supply option to pursue should be based in part on the reaction of the public to the waterflood scheme.

As a minimum, the following groups should be advised of a company's intent to develop plans for a waterflood and be made aware of the issues:

1. Alberta Environment - Water Rights Branch
2. local MLA
3. local citizens and stakeholders
4. Farmers Advocate
5. county and municipal officials.

Once the water supply alternatives have been assessed and ranked, Phase II Detailed Assessments may be instituted on the most desirable options.

The detailed evaluation of a groundwater supply will consist of the following components:

1. exploration permit
2. public notice
3. field verified water well inventory
4. drilling of test well and observation wells
5. testing aquifer parameters
6. groundwater quality
7. assessment of cone of depression
8. mitigation of undesirable impacts

9. evaluation of groundwater reserve
10. recommendation for operation
11. monitoring recommendations

The procedure for licencing of surface water supplies does not require the same element of testing and evaluation that is necessary in a groundwater study. Key components of the detailed design include:

1. water intake structure
2. pump house and treatment facilities
3. design and routing of pipeline
4. wildlife and aquatic protection
5. mitigation of potential interference with navigation
6. design of water storage facilities
7. mitigation of potential impact on other users
8. impact of withdrawal on the flow regime.

Prior to submission of the application permit or licence, it is advantageous to discuss the results of the detailed evaluation or design with the public.

An application for a licence to divert water consists of a duly completed Form WR-1 and three copies of the groundwater evaluation or design of the surface water system. The period between submission of an application to divert and the issuing of a licence or permit may take serveral months, but in any case, will not be less than 10 days.

Once a permit or licence to divert water has been issued, it is necessary to observe the terms and conditions of the permit in order to keep it. Care should be taken to make the personnel responsible for the operation of the waterflood aware of the terms and conditions and the implications if violations occur.

For futher information, the handbook user should refer to:

1. **Water Well Construction Standards**
   Available: Alberta Water Well Association
   phone: (403) 427-6190.
2. **Groundwater Allocation Policy for Oilfield Injection Purposes**
   Available: Water Resources Administraton Division, Alberta Environment
   phone: (403) 427-6241.
3. **Groundwater Projects - How to Obtain a Licence or Permit**
   Available: Water Resources Administration Division, Alberta Environment
   phone: (403) 427-6241.
4. **Surface Water Projects - How to Obtain a Licence or Permit**
   Available: Water Resources Administration Division, Alberta Environment
   phone: (403) 427-7054.
5. **Water Resource Management Principles for Alberta**
   Available: Planning Division, Alberta Environment
   phone: (403) 427-6168.
6. **Guideline for Developing Water supplies for Oilfield Purposes in Alberta**
   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

5.3.11 NOISE CONTROL

New guidelines are currently being developed and reviewed. Further information is provided in Section 8.8

5.3.12 SPILL PREVENTION AND CONTAINMENT

Section 8.050 of The Oil and Gas Conservation Regulations (AR 151/17) deals with the control of oil and saltwater spills. The Regulations describe notification procedures and provide guidelines for the preparation of oil and saltwater spill reports.

Numerous documents and courses are available through the Canadian Petroleum Association (CPA) and the Petroleum Industry Training Service (PITS). These documents and courses are as follows:

CPA

1. A Feasibility Study of Air Sparging Systems for the Prairie Region
2. Air Bubble Diverter
3. Oil Recovery from Under Ice
4. An Introduction for Field Personnel to the Effects of Oil Spills on Soil and Some General Restoration and Cleanup Procedures
5. Oil Spill Cleanup and Site Reclamation, Edition II
6. Field Manual: Information and Action Regarding Saltwater and Related Spills in Saskatchewan Oil Fields.

PITS

1. Oil Spill Containment and Recovery: A Primer
2. Oil Spill Containment and Recovery: Short Course Manual
3. Transportation and Spill Response for Dangerous Goods (course)
4. On-Scene Spill Commander Course (course)
5. Oil Spill Equipment and Deployment Planning (course).

For more information contact:

Canadian Petroleum Association
phone: (403) 269-6721

Petroleum Industry Training Service
phone: (403) 250-9606

Two factors in oil spill prevention are adequately trained supervisors and operating personnel. The basic guidelines which should be observed to prevent accidental oil discharges are (API, 1974):

1. Critically examine each area of the facility to determine where the potential for a discharge exists. Detailed analyses of past discharges from other facilities can help to locate areas where changes in equipment or operating practice are needed.
   Things to look for are:
   a) pipes subject to vibration,
   b) dead piping and temporary connections which should be removed if no longer required,
   c) uneven tank settlement.
2. In accordance with the information obtained in 1. above:
   a) Modify existing facilities or install new equipment or instrumentation as needed to reduce the possibility of discharges. Consider the use of alarms, automatic shutdown equipment, or fail-safe equipment to prevent, control, or minimize potential discharge resulting from equipment failure or human error.
   b) Establish maintenance and/or corrosion abatement programs to ensure continued adequacy of all equipment.
   c) Establish routinely scheduled tests and inspections of lines, vessels, dump valves, alarm systems, safety valves, hoses and other pollution prevention equipment where failure(s) and/or malfunction(s) could result in a potential discharge incident.

   d) Prepare comprehensive operating procedures designed to minimize potential discharges. These operating procedures should be clearly written and available to all operating personnel.

   e) Field drainage patterns should be studied and oil traps constructed in drainage ditches at strategic points to trap discharge oil before it reaches streams or water basins. Refer to Section 5.3.3 for additional guidelines on site drainage.

3. Develop training programs on discharge prevention fundamentals and present these programs to operating personnel as often as necessary to keep them well versed on desirable discharge prevention practices. The Petroleum Industry Training Service offers such training programs.

4. Develop contingency and shut-down plans for response to natural disasters, and to minimize the potential for oil spills or incidents causing pollution or other environmental damage. "Suggested Procedure for Development of Spill Prevention Control and Countermeasure Plans" (API #2,1974) contains information which may be useful. This document is available from the American Petroleum Institute.

All spills of petroleum, industrial chemicals, brine and process fluids (such as boiler compounds, etc.) must be confined to the lease and prevented from infiltrating potable groundwater aquifers. This may require removal of contaminated soil to a safe location. Any spills off lease or over 2 m^3 must be reported to the ERCB - Environment Protection Department. All facilities should have a containment (dyked) area as described in Section 4.3.5.

CONTAMINANT		CANADA AMIBIENT AIR QUALITY OBJECTIVES		ALBERTA
	Averaging Time	Max. Acceptable Level	Max. Tolerable Level	Max. Tolerable Level
Sulphur Dioxide (ppm)	1/2 hour			525
	1 hour	900 (0.34)	800 (.031)	450
	24 hours	300 (0.11)		150
	Annual	60 (0.02)		30
Hydrogen Sulphide (ppb)	1/2 day	--		--
	1 hour	15 (10.8)		14
	24 hours	5 (3.6)		4
Suspended Particulate Matter (TSP)	1/2 hour	--	--	
	24 hours	120	400	100
	Annual	70	--	60
Carbon Monoxide	1 hour	35000 (30)	--	15000
	8 hours	15000 (13)	20,000	6000(5)
Total Oxidants (ppm)	1 hour	160 (0.08)	300 (0.15)	160
	24 hours	50 (0.025)	--	50
	Annual	30 (0.015)	--	--
Nitrogen Dioxide (ppm)	1 hour	400 (0.2)	1000 (0.53)	400
	24 hours	200 (0.1)	300 (0.16)	200
	Annual	100 (0.05)	--	60

Air Quality Objectives and Standards in mass units (ug/m^3)

Table 5.2 CANADA AMBIENT AIR QUALITY OBJECTIVES
(Reference: Environment Canada, 01/02/86)

Table 5.3

MINIMUM DISTANCE REQUIREMENTS SEPARATING PROPOSED SOUR WELLS FROM RESIDENTIAL AND OTHER DEVELOPMENTS

(From ERCB ID 87-2)

In order to select appropriate well locations having regard for public safety and present and future land-use, the Board has established the following level classification* for sour wells. Each level classification has corresponding minimum separation distances between sour wells and residential and other developments. The distances increase as the suspended/producing H_2S release rate potential increases, and with increasing population density.

(a) Level 1 sour well: Any well with a maximum potential H_2S release rate of 0.01 m^3/s or greater and less than 0.3 m^3/s. All wells remain subject to section 2.110 of the Oil and Gas Conservation Regulations which require a 0.1-km separation distance between it and any surface improvement. The Board may specify some other separation distance for a Level 1 sour well should the circumstances warrant such action.

(b) Level 2 sour well: Any well with a maximum potential H_2S release rate of 0.3 m^3/s or greater and less than 2.0 m^3/s. A Level 2 sour well shall be located to provide 0.1-km separation distance between it and any dwelling, and 0.5-km separation distance between it and any urban centre or public facility.

(c) Level 3 sour well: Any well with a maximum potential H_2S release rate of 2.0 m^3/s or greater and less than 6.0 m^3/s. A Level 3 sour well shall be located to provide 0.1-km separation distance between it and any dwelling, 0.5-km separation distance between it and any unrestricted country development, and 1.5-km separation distance between it and any urban centre or public facility.

(d) Level 4 sour well: Any well with a maximum potential H_2S release rate of 6.0 m^3/s or greater. A Level 4 sour well shall be so located that as a minimum, it meets the requirements set out for a Level 3 sour well. However, the Board may require greater separation distances or set out other such requirements as it deems necessary.

With regards to encroachment of proposed surface development on existing sour wells, the Subdivision Regulations pursuant to the Planning Act reflect similar setbacks to the Board's separation distances.

* Level Classifications: a designation to stipulate separation distances of sour wells for land-use and public safety purposes. The level classification for sour wells is determined by assessing the maximum potential surface H_2S deliverability that can be attained against zero back pressure during the suspended/producing stage of a well. A well may be completed with a packer and capable of flowing through tubing only, or completed without a packer and capable of flowing through tubing and also up the annulus. The appropriate flow configuration must be considered in arriving at the level classification.

Table 5.3 (continued)

MINIMUM DISTANCE REQUIREMENTS SEPARATING PROPOSED SOUR WELLS FROM RESIDENTIAL AND OTHER DEVELOPMENTS

(From ERCB ID 87-2)

Level Classification	Producing/Suspended H_2S Release Rate m^3/s	Minimum Distance from Proposed Well to Various Developments
1	$\geq 0.01 - < 0.3$	0.1 km as stated in Section 2.110 of the Oil and Gas Conservation Regulations
2	$\geq 0.3 - < 2.0$	0.1 km to any dwelling 0.5 km to any urban centre or public facility
3	$\geq 2.0 - < 6.0$	0.1 km to any dwelling 0.5 km to an unrestricted country development 1.5 km to an urban centre or public facilty
4	≥ 6.0	As specified by the ERCB but not less than Level 3

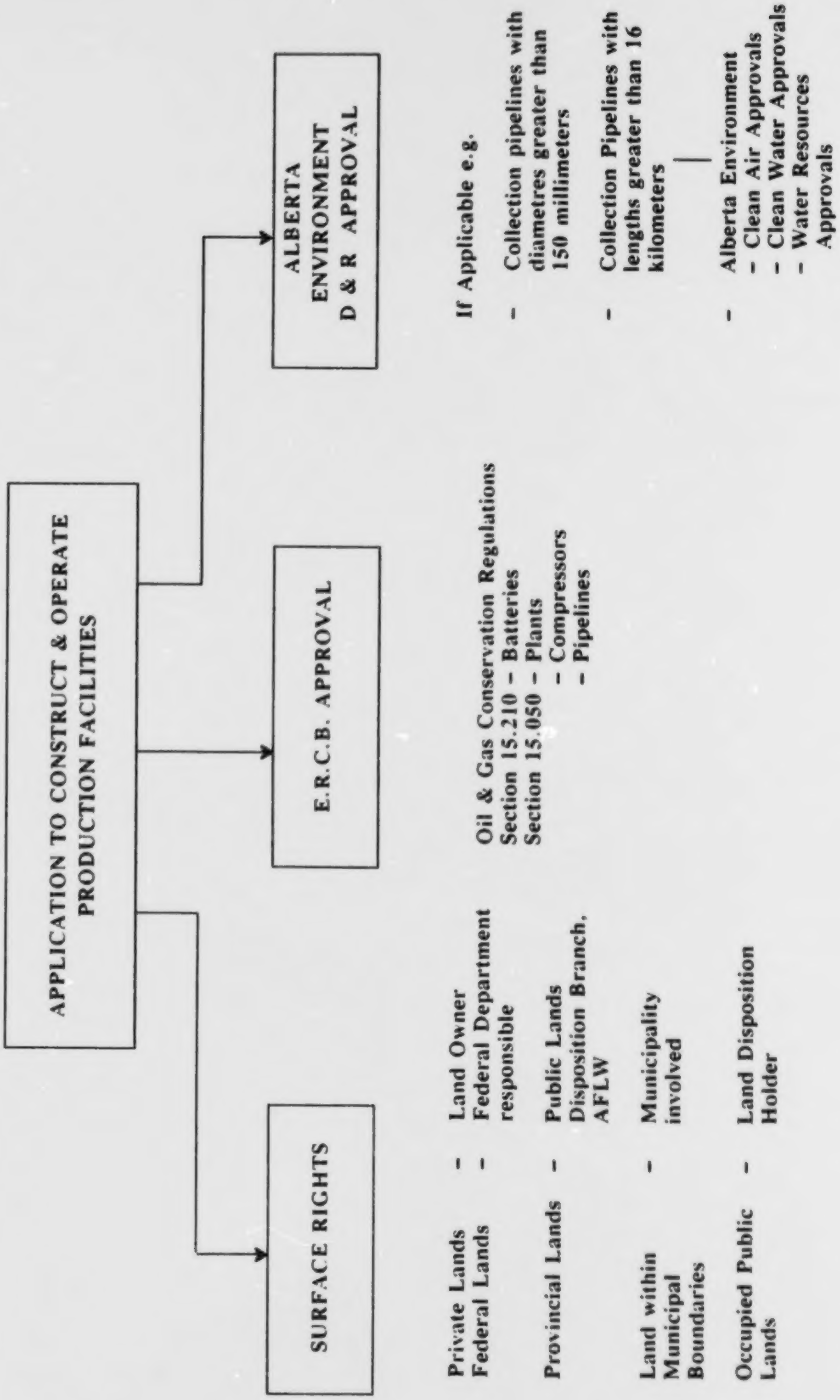
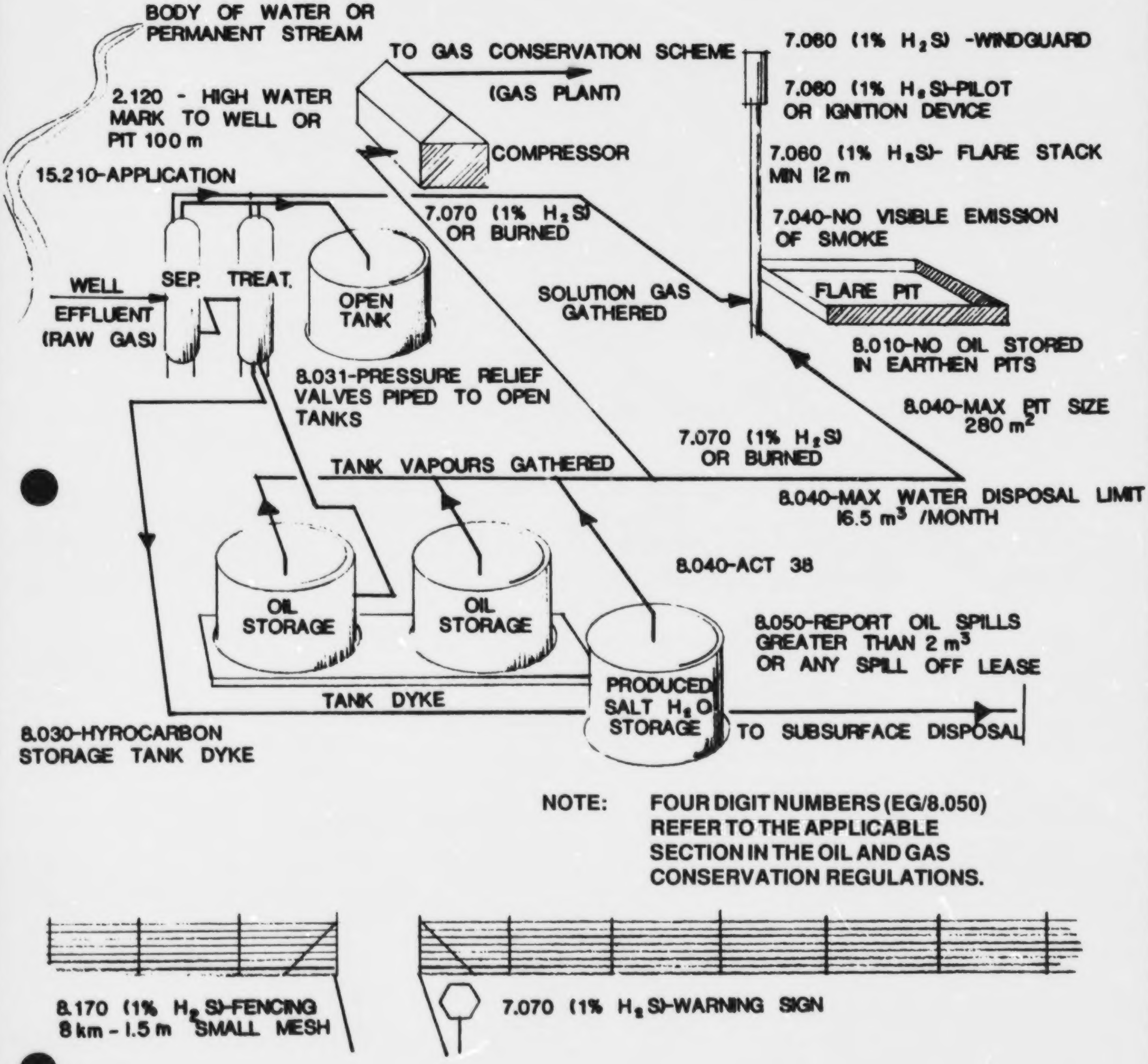

APPLICATION TO CONSTRUCT & OPERATE PRODUCTION FACILITIES
SURFACE RIGHTS
Private Lands - Land Owner
Federal Lands - Federal Department responsible
Provincial Lands - Public Lands Disposition Branch, AFLW
Land within Municipal Boundaries - Municipality involved
Occupied Public Lands - Land Disposition Holder
E.R.C.B. APPROVAL
Oil & Gas Conservation Regulations
Section 15.210 - Batteries
Section 15.050 - Plants
- Compressors
- Pipelines
ALBERTA ENVIRONMENT D & R APPROVAL
If Applicable e.g.
- Collection pipelines with diametres greater than 150 millimeters
- Collection Pipelines with lengths greater than 16 kilometers
- Alberta Environment
- Clean Air Approvals
- Clean Water Approvals
- Water Resources Approvals

Figure 5.1

APPLICATION TO CONSTRUCT AND OPERATE PRODUCTION FACILITIES

(Reference: David Bromley Engineering (1983) Ltd..)


BODY OF WATER OR PERMANENT STREAM
TO GAS CONSERVATION SCHEME
(GAS PLANT)
7.060 (1% H_2S) -WINDGUARD
7.060 (1% H_2S)-PILOT OR IGNITION DEVICE
2.120 - HIGH WATER MARK TO WELL OR PIT 100 m
COMPRESSOR
7.060 (1% H_2S)- FLARE STACK MIN 12 m
15.210-APPLICATION
7.070 (1% H_2S) OR BURNED
7.040-NO VISIBLE EMISSION OF SMOKE
WELL EFFLUENT (RAW GAS)
SEP.
TREAT.
OPEN TANK
SOLUTION GAS GATHERED
FLARE PIT
8.010-NO OIL STORED IN EARTHEN PITS
8.031-PRESSURE RELIEF VALVES PIPED TO OPEN TANKS
8.040-MAX PIT SIZE 280 m^2
7.070 (1% H_2S) OR BURNED
TANK VAPOURS GATHERED
8.040-MAX WATER DISPOSAL LIMIT 16.5 m^3 /MONTH
8.040-ACT 38
OIL STORAGE
OIL STORAGE
8.050-REPORT OIL SPILLS GREATER THAN 2 m^3 OR ANY SPILL OFF LEASE
PRODUCED SALT H_2O STORAGE
TANK DYKE
TO SUBSURFACE DISPOSAL
8.030-HYROCARBON STORAGE TANK DYKE
8.170 (1% H_2S)-FENCING 8 km - 1.5 m SMALL MESH
7.070 (1% H_2S)-WARNING SIGN

NOTE: FOUR DIGIT NUMBERS (EG/8.050) REFER TO THE APPLICABLE SECTION IN THE OIL AND GAS CONSERVATION REGULATIONS.

Figure 5.2 ENVIRONMENTAL CONTROL AT AN OIL PRODUCTION BATTERY
(Reference: ERCB Calgary, Alberta 1973)

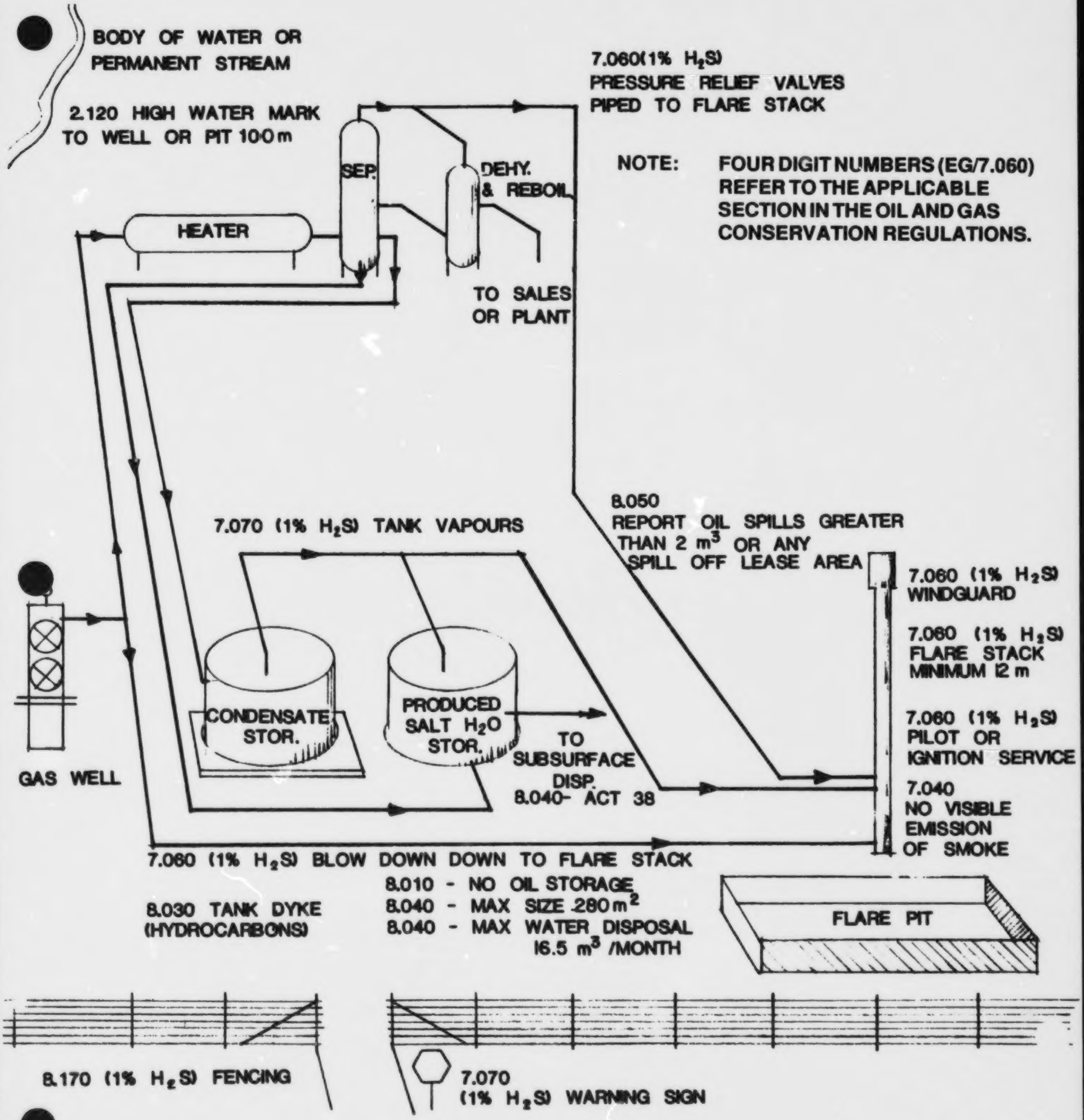

BODY OF WATER OR PERMANENT STREAM
2.120 HIGH WATER MARK TO WELL OR PIT 10.0 m
7.060 (1% H_2S) PRESSURE RELIEF VALVES PIPED TO FLARE STACK
NOTE: FOUR DIGIT NUMBERS (EG/7.060) REFER TO THE APPLICABLE SECTION IN THE OIL AND GAS CONSERVATION REGULATIONS.
SEP.
DEHY. & REBOIL
HEATER
TO SALES OR PLANT
8.050 REPORT OIL SPILLS GREATER THAN 2 m^3 OR ANY SPILL OFF LEASE AREA
7.070 (1% H_2S) TANK VAPOURS
7.060 (1% H_2S) WINDGUARD
7.060 (1% H_2S) FLARE STACK MINIMUM 12 m
CONDENSATE STOR.
PRODUCED SALT H_2O STOR.
TO SUBSURFACE DISP.
8.040- ACT 38
7.060 (1% H_2S) PILOT OR IGNITION SERVICE
7.040 NO VISIBLE EMISSION OF SMOKE
GAS WELL
7.060 (1% H_2S) BLOW DOWN DOWN TO FLARE STACK
8.010 - NO OIL STORAGE
8.040 - MAX SIZE 280 m^2
8.040 - MAX WATER DISPOSAL 16.5 m^3 /MONTH
8.030 TANK DYKE (HYDROCARBONS)
FLARE PIT
8.170 (1% H_2S) FENCING
7.070 (1% H_2S) WARNING SIGN

Figure 5.3 ENVIRONMENTAL CONTROL AT A GAS PRODUCTION FACILITY
(Reference: ERCB Calgary, Alberta 1973)

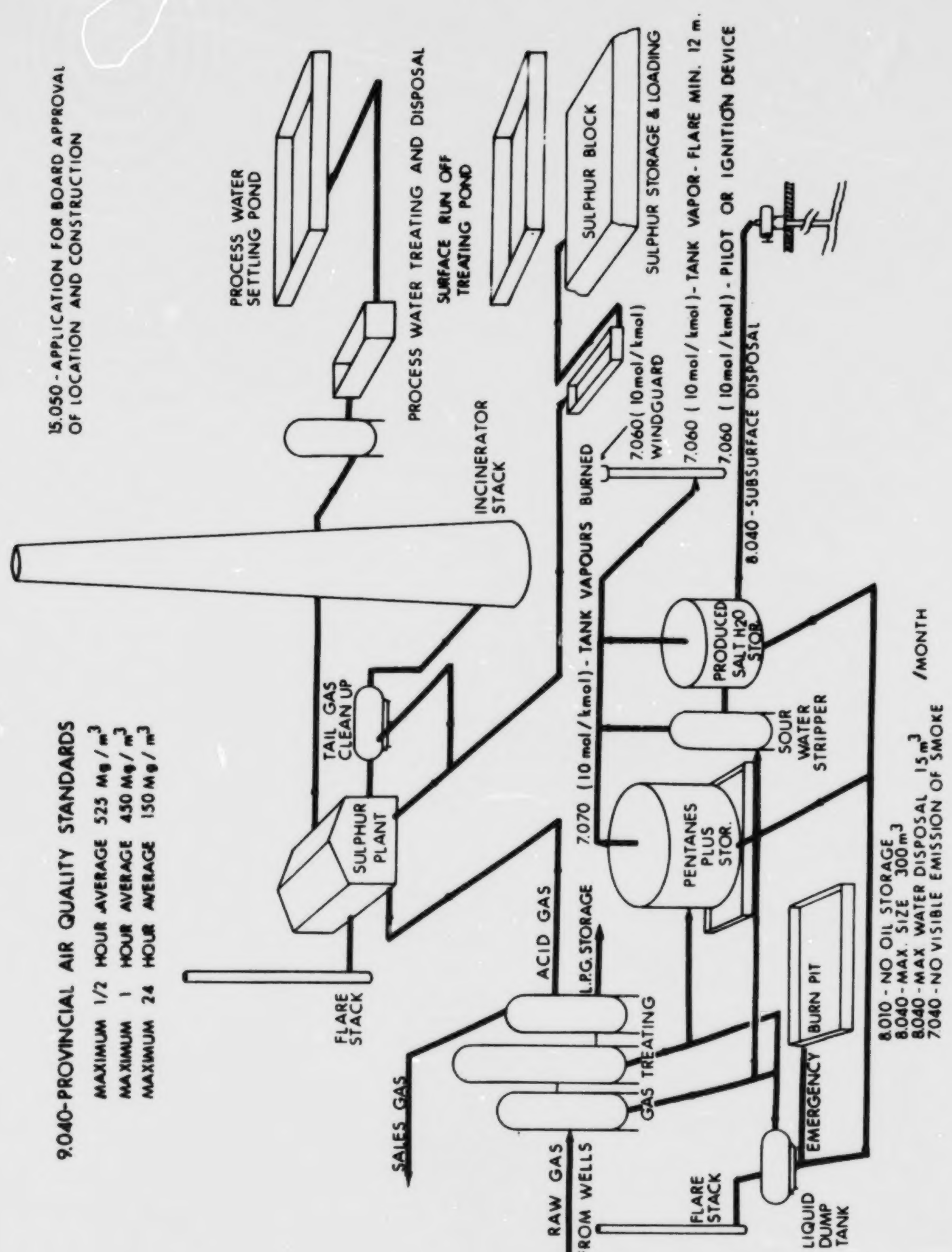

9.040-PROVINCIAL AIR QUALITY STANDARDS
MAXIMUM 1/2 HOUR AVERAGE 525 Mg/m³
MAXIMUM 1 HOUR AVERAGE 450 Mg/m³
MAXIMUM 24 HOUR AVERAGE 150 Mg/m³
15.050 - APPLICATION FOR BOARD APPROVAL OF LOCATION AND CONSTRUCTION
PROCESS WATER SETTLING POND
FLARE STACK
TAIL GAS CLEAN UP
SULPHUR PLANT
INCINERATOR STACK
SALES GAS
ACID GAS
PROCESS WATER TREATING AND DISPOSAL
SURFACE RUN OFF TREATING POND
RAW GAS FROM WELLS
L.P.G. STORAGE
GAS TREATING
7.070 (10 mol/kmol) - TANK VAPOURS BURNED
7.060 (10 mol/kmol) WINDGUARD
SULPHUR BLOCK
PENTANES PLUS STOR.
PRODUCED SALT H2O STOR.
SULPHUR STORAGE & LOADING
7.060 (10 mol/kmol) - TANK VAPOR - FLARE MIN. 12 m.
SOUR WATER STRIPPER
FLARE STACK
EMERGENCY
BURN PIT
7.060 (10 mol/kmol) - PILOT OR IGNITION DEVICE
8.040 - SUBSURFACE DISPOSAL
LIQUID DUMP TANK
EMERGENCY
8.010 - NO OIL STORAGE
8.040 - MAX. SIZE 300 m³
8.040 - MAX WATER DISPOSAL 15 m³ /MONTH
7040 - NO VISIBLE EMISSION OF SMOKE

Figure 5.4 ENVIRONMENTAL CONTROL AT A GAS PROCESSING PLANT
(Reference: ERCB Calgary, Alberta 1973)

Section 6.0

TABLE OF CONTENTS

6.0 PIPELINES

- 6.1 Application Procedures
- 6.2 Jurisdictions, Permits and Approvals
  - 6.2.1. Potential Permits for Pipeline Development
- 6.3 Specific Environmental Guidelines
  - 6.3.1 Pipeline Alignment and Location of Ancillary Facilities
  - 6.3.2 Construction Practices
  - 6.3.3 Spill Contingency Plans for Operating Systems
  - 6.3.4 Right-of-Way Maintenance and Weed Control
  - 6.3.5 Operation and Maintenance
  - 6.3.6 Abandonment

LIST OF TABLES

Number	Title
6.1	Environmental Concerns Directory

LIST OF FIGURES

Number	Title
6.1	Application Procedure to Construct and Operate a Pipeline
6.1a	Application Procedures D & R Approvals
6.2	Pipeline Right-of-Way
6.3	Grading the Right-of-Way
6.4	Two-Toning the Right-of-Way
6.5	Sequence of Topsoil Handling
6.6a	Trench Width Topsoil Stripping
6.6b	Blade Width Topsoil Stripping
6.6c	Trench and Spoil Area Topsoil Stripping
6.6d	Trench, Spoil and Work Area Topsoil Stripping
6.7	Compaction of Backfill
6.8	Roaching the Trench
6.9a	Sack Breaker
6.9b	Typical Bentonite/Sand Ditch Block
6.10	Subdrain Detail

6.0 PIPELINES

This section provides guidelines and information on the construction, alteration, extension, abandonment and operation of pipelines.

Pipelines must be engineered to be compatible with several types of terrain and crossing large expanses of forest, grazing land, farm land, marshes and water bodies. All of the areas affected by construction should be restored to a suitable condition compatable with the surrounding environment. Factors which will help to reduce the impact of construction and operation are:

1. **environmental planning and proper route selection**
2. construction personnel training
3. operator training

Table 6.1 is a quick reference which outlines environmental concerns, the location of information within this handbook and the regulatory contact for each environmental concern.

The ERCB has prepared a number of Interim Directives (ID) and Informational Letters (IL) regarding environmental concerns for pipelines. Relevant ID's and IL's are as follows:

ID 81-4	Proposed Wells and Pipelines Near Urban Centres
ID 85-1	Pipeline Permit and Licence Applications
ID 85-2	Changes to Pipeline Application and Approval Procedures
IL 80-11	Joint Use of Right-of-Way
IL 85-2	Leak Prevention and Detection

6.1 APPLICATION PROCEDURES

Before commencing the construction, operation, alteration, extension or abandonment of a pipeline, the proponent must apply for and obtain:

1. ERCB Approval, according to the Pipeline Regulations (AR 122/87)
2. Development and Reclamation (D & R) Approval, or amendments to regulated or deemed regulated facilities, for pipelines with diameters greater than 150mm and lengths (sum of the parts) greater than 16km, according to The Land Surface Conservation and Reclamation Act and Regulations thereunder:
   a) Land Conservation Regulations (AR 125/75)
   b) Regulated Oil and Gas Pipeline Surface Operations Regulations (AR 207/76)
   c) Restricted Development Area Regulations - Section 15 of Department of Environment Act
3. Surface Rights, Alberta Culture Approval, Alberta Environment Approval under the Clean Water and Water Resources Acts, Alberta Municipal Affairs Approval and Alberta Recreation and Parks Approval.

The application process is shown in graphic form in Figures 6.1 and 6.1a. Applications for an ERCB Permit to Construct should include a D & R Application if necessary. Both should be submitted at the same time so that they can be reviewed in a coordinated manner by the ERCB and Alberta Environment.

Potentially, the D & R application may require a:

1. Route and Site Selection Report
2. Development Plan
3. Environmental Protection Plan which includes:
   a) a reclamation plan
   b) stream crossing layouts
   c) erosion control procedures

TABLE 6.1

SECTION 6.0 – PIPELINES
ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Route Selection	6.3.1	• Alberta Environment (427–6323) Property owners – if on Crown land contact Forest or Public Lands Officer (See Appendix C for regional field offices of AFLW)
Access Roads	6.3.1, 8.1	• Same as above • Alberta Transportation & Utilities (See Appendix C for regional offices • Municipal Jurisdictions
Cutting, Clearing, Timber Salvage and Debris Disposal	6.3.2.4	• Forest Officers (See Appendix C for regional field offices of AFLW)
Archaeological	6.3.2.1	• Archaeological Survey of Alberta (431–2300)
Environmental Parameters (e.g. soils, topography, stream crossings)	Appendix B	• Air photos (427–3519) • Maps (427–3520) • Soils Branch (427–5373 – Agriculture) • Soils – Alberta (438–7555)
Wildlife, Fisheries and Habitat Protection	6.3.2.3, 6.3.2.4	• Fish and Wildlife (427–6730) • See Appendix C for regional offices
Erosion Control	6.3.2.5, 8.5	• Alberta Environment (427–6323) • (See Appendix C for regional offices of Alberta Environment) and AFLW – Forestry and Public Lands)
Testing	6.3.2.6	• ERCB (297–8121) • Alberta Environment (427–6323) • Pollution Control (427–5868) (See Appendix C for regional offices of Alberta Environment) and the ERCB)
Contingency Plans	6.3.2.7, 6.3.3 8.9	• Alberta Environment (427–6323) • ERCB (297-8121)
Spills	6.3.3, 8.4.3	• ERCB and Alberta Environment regional offices (See Appendix C)

TABLE 6.1 (CONTINUED)

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Cleanup and Site Restoration	6.3.2.8, 8.4	• Alberta Environment (426-6323) • ERCB (See Appendix C for regional offices) • Property owner – on Crown land contact Forestry or Public Lands regional field Officer (See Appendix C)
Stream Crossings	6.3.2.9, 8.2	• Alberta Environment (See Appendix C for Water Resources Regional Administrators) • Fish and Wildlife (See Appendix C for regional offices)
Weed Control	8.11	• Alberta Environment Pesticides Branch (427–5855)
Reclamation	8.4	• Alberta Environment Reclamation Council (427–6323) (See Appendix C for regional offices)
Development and Reclamation (D & R) Approval	8.4.1	• Same as above
Abandonment and Decommissioning	8.10	• Same as above
Sand, Gravel and Borrow Pit Operations	8.3	• Alberta Environment (427–6323) • Property owner – if on Crown land contact Forestry or Public Lands Officer (See Appendix C)
Camps	8.6	• See Appendix C for forest region or public land region field personnel

d) fish and wildlife protection procedures

as defined in the Land Surface Conservation and Reclamation Act and Regulations.

The Director of the Land Conservation and Reclamation Council may waive the requirement to submit any of the development and reclamation reports listed above. It is therefore advisable for a proponent to contact the Land Reclamation Division of Alberta Environment and determine which of the reports will be required. Approvals must be received from Alberta Government Telephones, Trans Alta Utilities or Alberta Power if any of their lines are crossed or closely paralleled.

The proponent should include the following components and steps in preparing the application for a permit to construct a pipeline:

1. development proposal
2. study area identification
3. alternative route selection
4. preliminary project meeting with Alberta Environment to discuss route selection
5. selection of the most technically feasible route
6. analysis of existing environment
7. route selection with least environmental impact
8. identification of site-specific environmental impacts on selected route
9. mitigation of impacts
10. preparation of environmental protection plan
11. D & R application submitted and reviewed
12. D & R approval
13. implementation of environmental plan
14. preparation of an as-built Environmental Report, if required.

For ERCB approval to construct and operate any pipeline, an application must be completed (a sample is provided in Appendix D). The "Pipeline Information System User's Manual" published by the ERCB provides a comprehensive guide for applicants.

Information available on Application Procedures includes:

1. **Information Requirements For Regulated Pipelines, 1982**

   Information: Document outlines application preparation, typical application process and D & R process.

   Available: Land Reclamation Division, Alberta Environment.
   phone: (403) 427-6323.

2. For updated information on pipeline application and approval procedures refer to ERCB ID 85-1 **"Pipeline Permit and Licence Applications" and** ERCB ID 85-2**"Changes to Pipeline Application and Approval Proceures."**

3. **Supplementary Information For Pipeline Applications**

   Information: Document outlines environmental concerns, construction concerns and potential permits.

   Available: Regulated Operations Branch, Alberta Environment.
   phone: (403) 427-6322.

6.2 JURISDICTIONS, PERMITS AND APPROVALS

The jurisdictions of the various regions of Alberta and of the various government agencies involved in monitoring and regulating pipeline construction and operation are provided in Chapter 2.0.

Prior to any formal application, the proponent should discuss the proposed activities with the particular landowner or land management agency involved:

Patented Lands contact private landowner

Public Lands Green Area – Forest Officer (see Appendix C for contacts)
White Area – Appropriate Public Lands Division (see Appendix C for contacts)

6.2.1 POTENTIAL PERMITS FOR PIPELINE DEVELOPMENT

The potential permits required for a pipeline development are:

Permit or Licence	Issuing Agency	Phone
Permit to Construct	Energy Resources Conservation Board	(403) 297-8146
Development and Reclamation Approval	Alberta Environment	(403) 427-6323
Surface Rights Crown Land – Pipeline Agreements (PLA) – Pipeline Installation Lease (PIL) – Right of Entry (ROE) – Other Permits and Leases as required	Alberta Forestry, Lands and Wildlife	(403) 427-3570
Patented Land - Negotiation and Approval (permission)	Landowner	
Water Resources – Licence to Divert – Permit to construct near or across a stream	Alberta Environment	(403) 427-6168
Road or Rail Crossing Permit	Alberta Transportation and Utilities, Municipality, Canadian National Railways, Canadian Pacific Railways	(403) 427-7071
Road Use Permits	Leaseholder, Municipality	
Historical Resources Permit	Alberta Culture	(403) 427-2355
Clean Air Permit	Alberta Environment	(403) 427-5872
Clean Water Permit	Alberta Environment	(403) 427-5888
Navigational Waters Approval	Transport Canada	(604) 984-3730
Pesticides/Herbicides Permit	Alberta Environment	(403) 427-5855
Burning Permit	Alberta Forestry, Lands and Wildlife	Local Forestry Office
Explosive Permit (for watercourses)	Alberta Forestry, Lands and Wildlife	Local Fish & Wildlife Office
Reclamation Certificate	Alberta Environment	(403) 427-6212 (403)427-3582
Trapper Compensation Review Plan	Alberta Forestry, Lands and Wildlife	(403) 427-3570

This list does not contain approvals that may be required at the local municipal government level.

6.3 SPECIFIC ENVIRONMENTAL GUIDELINES

6.3.1 PIPELINE ALIGNMENT AND LOCATION OF ANCILLARY FACILITIES

General guidelines indicate that the following should be considered for route selection and alignment:

1. sources and points of supply and delivery
2. technical feasibility
3. access for construction and maintenance
4. seismic history
5. clearing requirements
6. soil conditions (e.g. permafrost)
7. other physical constraints and the potential impact upon the natural environment
8. use of existing rights-of-way
9. construction scheduling.

Environmental considerations include:

1. wildlife and aquatic habitat protection
2. general topography such as gradients and numbers and sizes of river crossings
3. drainage patterns
4. proximity to water bodies
5. surface stability
6. areas of environmental hazards
7. areas of known sand and gravel deposits
8. conflict with existing land leases
9. conflict with archaeological and heritage resources
10. land uses
11. soil types.

Specific guidelines for pipeline routing during the planning stage are (AFS, 1984; ERCB ID 81-4):

1. Prior to making formal application to the ERCB for approval of a selected route, the proponent should discuss the proposed development with the various landowners or management agencies responsible as discussed in Section 6.2.
2. Wherever possible, a right-of-way should be paralleled with existing utility rights-of-way utilizing existing clearing and access routes to minimize the amount of land used and new timber damage. (See ERCB IL 80-11.) On agricultural land the right-of-way should minimize the impact on the field.
3. Alignments which minimize the requirements for gravel and other fill material should be selected, along with sites for stockpiles, camps and other facilities which reduce the need for new access routes and establish the least number of new sites. For information on campsites refer to Section 8.6.
4. Areas where revegetation or rehabilitation is anticipated to be difficult should be avoided.
5. Adequate geotechnical information should be obtained and used in locating facilities and selecting alignments which will ensure the stability and integrity of the pipeline system and minimize adverse environmental effects, particularly for stream crossings. This information should include:
    a) surficial geology
    b) landform and soil type
    c) soil permeability and pore water pressure

    Sources of geotechnical information for Alberta are given in Appendix B.

6. Land areas subject to mud flows, landslides, avalanches, rock falls and other types of mass movement should be avoided.
7. The alignments selected should be those which will require clearing of the narrowest possible right-of-way.
8. River and stream crossings should be selected so as to provide for maximum stability of banks and to avoid slope failure or erosion.
9. The right-of-way should be located so as to provide a buffer strip of undisturbed land along rivers and streams and beside lakes, except where necessary for crossings. This buffer strip must be a minimum of 100m in width, except in areas where terrain features do not make this practical.
10. Buffer strips of undisturbed land and vegetation should be left as follows:
    a) 100m between roads and watercourses and/or water bodies except as otherwise approved by the Forest Officer/Public Lands Officer.
    b) 150m between public roads and material sites (e.g. borrow stockpile areas, construction camps or compressor stations).
11. Areas having known important historical or archaeological value must be avoided. Prior to construction, a qualified archaeologist should survey the intended route to determine if it passes through any areas which have potential historical or archaeological value. In addition, the route should be reviewed by Alberta culture if required.
12. The right-of-way should by-pass all designated recreational sites (campgrounds, waysides, parks) and all domestic, commercial and sport fishery areas. If such areas cannot be avoided, consult the Forest Officer/Public Lands Officer for advice on buffering the pipeline route.
13. Problem areas should be identified on a map or mosaic of the pipeline alignment for resolution by field assessment prior to any construction.
14. The access road alignment and design should minimize interference with natural drainage patterns and avoid unstable slopes. See Section 8.1 for more information on access roads.
15. Appropriate measures should be incorporated into the design to minimize erosion. See Section 8.5 for more information on erosion control.
16. In forested regions, the routing should avoid cutting through areas reserved for seed production.
17. When passing through woodlots or forests, the clearing width should be kept to a minimum except where widening is required for stabilizing cut slopes.
18. Pipeline and road alignments, and sites of permanent ancillary facilities, should avoid areas for wildlife populations as defined by the regional Fish and Wildlife Biologist. These include:
    a) areas used by animals during critical phases of the life cycle (e.g. ungulate winter range and mineral licks)
    b) moose calving areas
    c) Bighorn sheep lambing areas
    d) fox and bear denning areas
    e) important waterfowl breeding, staging and feeding areas
    f) raptor nesting sites
    g) areas known to support species considered to be rare and endangered.

    There are times of the year, however, when these areas could accommodate pipeline construction. The Regional Habitat Biologist should be consulted for these periods. Key Area maps are available from the Fish and Wildlife Division of Alberta Forestry, Lands and Wildlife.
19. Any activity within 3km of a designated Federal or Provincial wildlife sanctuary, natural research area, ecological preserve, or other designated area is subject to approval of the authority having jurisdiction. (See Appendix C for contacts.)
20. Ancillary facilities should not be located where they will interfere with natural drainage patterns, cause erosion, or seriously alter the hydrologic regime or water quality.

21. Construction camps, compressor stations or other field operations should be located in areas where surface or groundwater withdrawal and return will not result in detrimental effects to the hydrologic regime. Refer to Section 8.6 for additional guidelines on construction camps.
22. Notice must be given to a Municipality if a pipeline (not including a gas distribution line with pressures of 700 kPa or less) is to be constructed within 1.5km of the corporate limits of a city, town or village (see ERCB ID 81-4.) If the Municipality does not object, a permit may be issued. If the Municipality does object, the objection would be heard by the ERCB.
23. Landfill waste disposal sites should be located where they will cause minimum interference with natural drainage patterns, and where leachates will not adversely affect water quality. Landfill waste disposal sites require approval of the Forest or Land Use Officer. Additional information on landfill waste disposal is given in Section 8.7 and in "Guidelines for Industrial Landfills" available from the Standards and Approvals Division of Alberta Environment.

Information available on pipeline alignment and location of ancillary facilities includes:

1. **Information Requirements For Regulated Pipelines, 1982**

   Information: Document includes a checklist of environmental issues and mitigation measures.

   Available: Land Reclamation Division, Alberta Environment
   phone: (403) 427-6323.

2. **The Route Selection Process: A Biophysical Perspective**

   Information: Outlines the usefulness of engineering, socioeconomic and biophysical components related to the selection of pipeline routes.

   Available: Alberta Energy
   phone: (403) 427-8042.

3. **Fisheries Habitat Protection Guidelines**

   Information: Guidelines provide information on
   - pipeline construction and stream crossings
   - handling oil spills
   - reservoirs and impoundments.

   Available: Fish and Wildlife Division, AFLW
   phone: (403) 427-6734.

4. **Environmental Handbook for Pipeline Construction**

   Information: Booklet outlines the impact of pipeline construction on the environment and gives right-of-way and installation guidelines.

   Available: Land Reclamation Division, Alberta Environment
   phone: (403) 427-6323.

6.3.2 CONSTRUCTION PRACTICES

The handbook User should obtain two documents entitled "Environmental Handbook for Pipeline Construction" and "Manual on Soil Conservation and Pipeline Construction". Both documents are available from the Land Reclamation Division of Alberta Environment. In addition, the environmental plan must be included in the contract specifications to ensure implementation during construction.

6.3.2.1 Right-of-Way Survey

The concern with right-of-way surveys is ensuring the proper right-of-way width is flagged and field sensitive areas (e.g. archaeological sites, sensitive soils) are avoided.

The guidelines regarding surveys are as follows:

1. Notify, if possible, landowners, Forest Officers and Public Land Officers of intent to conduct a survey.
2. Instruct surveyors to carry out their duties in an environmentally responsible manner. Make them aware of particularly sensitive areas.

3. Walk through sensitive areas and adjust right-of-way if possible to avoid sidehills, poor water crossing approaches, shelterbelts, granaries, and other structures.
4. Determine standard right-of-way width considering factors described in Figure 6.2. Identify specific locations requiring additional right-of-way. Mark off areas where special procedures are to be used.
5. Flag right-of-way boundaries and limits of clearing with stakes and flagging. Maintain stakes and flagging throughout construction period.
6. Confine construction activities to the right-of-way, designated access roads (shooflies), and ancillary sites. If additional right-of-way is required during construction, obtain written consent from the landowner or approvals from authorities having jurisdiction.
7. Fence known archaeological or heritage resource sites adjacent to or in proximity to the right-of-way, to avoid inadvertent damage during construction. Install fences to preserve shelterbelts, shade trees, dugouts, and other significant features.

6.3.2.2 Notification of Concerned Parties

Failure to properly notify concerned parties may violate regulatory conditions, interfere with other land uses, and inconvenience or annoy landowners by poor timing and inappropriate construction methods.

The following guidelines are worth noting:

1. Obtain all necessary approvals, permits, licences, and right-of-way agreements prior to construction and post at the construction site.
2. Notify all appropriate provincial and local government representatives as stipulated in conditions of approval. Maintain contacts until project is completed.
3. Notify landowners and tenants of right-of-way location and construction schedules well in advance of entering their lands. Notify landowners and tenants of any revisions to the proposed schedule. Maintain these contacts until project is completed.
4. At least five days prior to entering their trapping areas, notify registered trappers by registered mail, normal mail, or in person. Inform trappers of right-of-way location and construction schedules.
5. Notify the local Fish and Wildlife Officer and registered trapper if pipeline construction will damage beaver ponds, dams and lodges, muskrat push-ups or other aquatic furbearer habitats. Ensure that a registered letter is sent to the trapper well in advance of any activities (minimum 5 days notice).
6. Notify Forest Management Agreement holders and quota holders prior to timber clearing and salvage operations.
7. Notify road, rail, and foreign pipeline owners as required by crossing and road use agreements.
8. Stop construction in the immediate area and notify the Archaeological Survey of Alberta if any previously unidentified archaeological or heritage sites are discovered during construction.
9. Make arrangements with landowner, if possible, to keep livestock in fields not traversed by the right-of-way. First, obtain consent prior to dismantling fences. Then, prior to construction, dismantle fences and install temporary gates, if required, to prevent livestock from entering or leaving the property.

6.3.2.3 Scheduling

Poor scheduling of construction activities can result in adverse impacts on soil, fish and wildlife resources as well as on agricultural, forestry, recreational and other land uses. Poor scheduling can impact a farmer/rancher's activities or fish spawning periods.

Guidelines for scheduling are as follows:

1. Schedule construction to proceed quickly with a tight spread and a minimum of open trench. Initial cleanup should follow immediately after backfill.

2. To ensure that traffic on the right-of-way is not impeded and environmental impact remains minimal, schedule construction during winter where the pipeline route traverses extensive muskeg. A minimum of 45cm of frost penetration in muskeg is necessary. Recommended frost depths for other materials are:

Loam Soils	15cm
Saturated Silts or Clays	30cm
Swamp, Sloughs or Shallow Water	90cm

   Ensure that the schedule allows for completion prior to normal spring break-up.
3. Schedule construction during low fire hazard season in forested areas.
4. Schedule construction to avoid spring break-up in order to minimize surface disturbance and major impacts on aquatic habitats.
5. For fisheries protection, schedule construction across watercourses during periods approved by Alberta Forestry, Lands and Wildlife, Fish and Wildlife Division. (see Section 8.2)
6. Schedule construction across, or in proximity to, important wildlife habitats during periods of low sensitivity as defined by Alberta Forestry, Lands and Wildlife, Fish and Wildlife Division.
7. Schedule construction to avoid interference with agricultural activities such as seeding and harvest.
8. Schedule construction to avoid working in irrigation districts during the irrigation season.
9. Schedule construction to avoid open-cutting roads during log-hauling in forested areas and grain-hauling in agricultural areas.
10. Schedule construction to avoid high-use periods across, or in proximity to, recreation areas.
11. Schedule construction to occur only between 0700 hours and 2000 hours near residential or other occupied lands such as campgrounds or parks.

6.3.2.4 Clearing, Timber Salvage and Debris Disposal

The Forest and Prairie Protection Regulations, Part II and the Timber Management Regulations stipulate the requirements for cutting, clearing and timber disposal for exploration lines and access routes. The handbook user should also refer to Sections 8.1 “Access Roads” and 8.4 “Reclamation and Conservation”.

Suitable spoil area locations will be identified by the District Forest Officer. Grading should be kept to a minimum in sensitive areas and tracked units should be considered as an alternative transport method to string pipe.

Debris and slash must be disposed of to reduce fire hazard, avoid compromising future uses of the site, maintain aesthetic quality and aid in revegetation and reclamation.

Specific guidelines for pipelines and ancillary facilities on Public land are provided below (AFLW #1, 1984):

1. Only the minimum area required for construction activities should be cleared of vegetation.
2. Buffer strips should be left as in Section 6.3.1.
3. All stream and river approaches and slopes with potentially unstable banks should be hand cleared to a distance of 100m from the high-water mark or to the top of the slope, where the slope is greater than 3:1 (33%).
4. Clearing of specially sensitive areas such as lake or stream crossing approaches should precede trenching by not more than one week, or as otherwise approved by the Forest Officer or Public Lands Officer (see Section 6.3.1). Listings of contact names are given in Appendix C.
5. Where timber has to be removed from a back slope beyond the approved right-of-way limits, approval must first be obtained from the Forest Officer.
6. Movements of ground vehicles should be strictly limited to designated access roads, ancillary sites and right-of-way boundaries.

7. Hand clearing may generally be carried out at any time of the year, subject to the prior approval of either or both the Forest Officer or Public Lands Officer. Activities of hand clearing crew support vehicles should be strictly controlled.
8. Dozer blades should be equipped with skid shoes to minimize disturbance of the surface vegetation and soil. This may not be possible. however, when the ground is frozen.
9. Machine clearing should not be permitted if clean breaks of trees cannot be achieved or if the number of uprooted trees is excessive. This method of clearing should be discussed with the Forest Officer or Public Lands Officer to determine whether it is acceptable or not.
10. Where clearing the right-of-way more than one summer in advance of construction has been approved by the Forest Officer or Public Lands Officer, the following additional stipulations might apply during the clearing phase:
    a) Sensitive slopes greater than 10 percent should not be cleared.
    b) Banks of, and approaches to, streams and major drainage courses should not be cleared.
    c) Only traffic directly related to clearing operations should be allowed to use the access roads.
    d) Grubbing or disturbances of the ground surface (e.g. removal of the organic mat, levelling of hummocks) to facilitate vehicle movement on access roads on the right-of-way should not be allowed.
    e) Traffic should be restricted to essential movement on the right-of-way prior to the start of actual pipeline construction.
11. Trees and other vegetation outside the clearing boundaries should not be cut and removed, with the exception of trees or snags posing a danger to pipeline operations.
12. Where commercial and economically marketable timber is to be salvaged, it should be hand-felled or cut by other techniques, limbed and stacked, and loaded on log pickup vehicles.
13. Felled trees should not land within 100m of any watercourse.
14. Logs should not be skidded or yarded across any stream, or driven into any watercourse.
15. Wood chips, bark or other slash materials should not enter any aquatic system.
16. The handbook User should refer to Section 8.4 "Reclamation and Conservation" for the appropriate guidelines for debris disposal.

Further information available on clearing, timber and debris disposal includes:

1. **The Resource Handbook, Operational Guidelines For Industry**

   Information: Handbook provides government acts, regulations and specifications as they relate to clearing, timber and debris disposal.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.

2. **Guidelines For The Reclamation of Linear Disturbances**

   Information: Document outlines guidelines for debris disposal along pipelines.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

3. **Habitat Enhancement and The Petroleum Industry**

   Information: Document describes techniques used in clearing, timber and debris disposal to enhance the habitat.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

6.3.2.5 Trenching, Pipe Laying, Backfilling and Grading

The Pipeline Regulation (AR 122/87) provides regulations that must be followed during pipeline design and construction. Under these regulations the proponent is required to provide detailed information on the following:

1. minimum earth cover
2. doubling of pipelines
3. crossing of other pipelines
4. crossing of highways
5. operation of construction ploughs
6. crossing of muskeg and other wet areas.

Many pipelines are buried in productive soils and hence disturbance of topsoils is a major environmental consideration. Basic factors in maintaining the fertility of soils are:

1. preservation of topsoil
2. prevention of rutting
3. prevention of soil compaction
4. replacement of soil horizons in their natural sequence
5. restoration of nutrient levels
6. removal of rocks from the surface zones and the restoration of the original surface configurations.

Physical, ecological and chemical concerns of soil disturbed by the pipeline are as follows:

1. Physical concerns: soil compaction, heat transfer from the pipe, the interference of capillary moisture regimes over the pipe, frost penetration over the trench line, the degradation of soil structure and the interference of water movement through the soil.
2. Ecological concerns: the loss of organic matter which supply nutrients to most micro-organisms, the introduction of dormant weed seeds and the loss of crop production during the construction and restoration phases.
3. Chemical concerns: the changes in pH and mineral composition of surface layers, the chemical decomposition of subsoil horizons exposed to aerobic conditions and the mixing of salts from subsoils with surface horizons.

The specific impacts of concern for grading, trenching, pipelaying and backfilling are:

1. slope stability and erosion
2. limitations of the movement of wildlife
3. mixing of topsoil
4. limiting the landuser's access to his land
5. poor compaction leading to drainage problems.

The guidelines for grading, trenching, pipe laying and backfilling are as follows:

1. Grading
    a) Minimize grade changes requiring excessive cuts and fills. Grade only as necessary to provide an adequate surface for construction equipment and to allow overbends and sags to be made within permissible bending limits (see Figure 6.3).
    b) Two-tone the right-of-way to limit the need for deep cuts and additional right-of-way on steep sidehills (see Figure 6.4).
    c) Minimize disturbance of natural drainage channels during grading; avoid blocking channels with graded material.

d) Grade away from watercourses to reduce the risk of material entering a watercourse. Do not place fill material in a watercourse during grading. If, however, potential bank restoration problems exist, the Fish and Wildlife Division of AFLW may request that the watercourse be filled with graded material as an alternative to cutting the banks.

e) Do not grade the entire right-of-way in proximity to a watercourse. When a ford is approved, grade only the trench line and the area immediately adjacent to the trench line for use as a work pad and travel surface.

f) For snow windrows that are greater than 1.0m in height, leave 3m gaps at regular intervals to allow for wildlife movement. Contact AFLW, Fish and Wildlife Division for spacing of gaps.

g) If archaeological or historical sites are discovered, suspend grading until permission to continue is granted by the Archaeological Survey of Alberta.

h) In forested areas, restrict root grubbing to the trench line on erodible slopes identified in the Environmental Protection Plan to maintain soil cohesion and minimize erosion. Use blade shoes (skid shoe, brush rake) to reduce surface disturbance and loss of topsoil when grubbing. Restrict grubbing in muskeg to avoid creation of bogholes. Restrict grubbing to within 2m of the right-of-way edge to prevent damaging adjacent trees. On winter projects, use snow to smooth out the working side if possible.

i) Delay grubbing slopes leading to watercourses or within a 10m zone of watercourse banks until construction of crossing is imminent. Leave an undisturbed organic mat within the buffer zone to limit the potential for introduction of sediment to the watercourse.

j) Stumps which remain after burning should be windrowed to the edge of the right-of-way.

k) Salvage root zone material on potential agricultural lands or on erodible slopes.

l) Salvage topsoil on agricultural lands according to procedures illustrated in Figures 6.6a, b, c and d. The sequence of topsoil handling is shown in Figure 6.5.

m) Do not use topsoil to ramp bar ditches on agricultural lands. Strip topsoil and ramp bar ditches with subsoil.

n) Suspend topsoil stripping during high wind or saturated conditions.

2. Trenching

a) Use alternative trenching equipment such as a plough or ditch witch where feasible. These procedures may be applicable on small diameter lines. Their advantage over conventional equipment, such as backhoes, is that they cause less disturbance and require less right-of-way.

b) Obtain permission and mark additional right-of-way at locations where extra space will be required to accommodate a wider or deeper trench. The extra space is necessary to store additional spoil. These locations commonly occur at crossings of roads, watercourses, railways, foreign lines, and in areas where rock will be encountered (see Figure 6.2). Extra cover is also necessary for future farm and logging equipment crossings, tile drainage, deep tillage and land levelling for irrigation. Ensure that topsoil is stripped and stockpiled where it will not be buried by the spoil pile. Also ensure that merchantable timber has been salvaged prior to trenching.

c) If soil conditions permit, bore major road crossings to minimize interference with road users and risk of road settlement. Boring is also useful in preserving roadside trees and blocking line of sight along the right-of-way. This procedure can also be used for crossing railways, foreign lines, irrigation canals, some watercourses and important shelterbelts.

d) If subsurface materials such as rock, gravel or organic material preclude boring, open cut the road. Notify road owners and users, and construct detours as required. Minimize duration of open cut crossing. Install safety barricades, fences, signs, and flashers around open road crossings. If possible, complete trenching, lowering-in and backfill within one working day.

e) Minimize the time between trenching and backfill. This interval is typically no more than three days and less than one day on winter jobs. When crossing critical wildlife habitats, the amount of continuous open trench may be specified by AFLW, Fish and Wildlife Division.

f) Delay trenching in areas with a high water table until just prior to lowering-in to prevent the trench from sloughing.

g) Stop trenching activities short of watercourse banks to prevent silty trench water from entering watercourses. Leave hard trench plugs in place until the watercourse crossing has been initiated. The recommended minimium plug width is 3.0m.

h) Avoid draining sloughs and waterholes with the trench unless permission has been granted by the landowner or government agency having jurisdiction. Leave hard plugs or install soft plugs as required.

i) Dewater the trench onto stable surfaces in a manner that does not cause erosion of soils or sedimentation of watercourses.

j) Leave gaps in the spoil pile at natural drainage channels to accommodate surface runoff. Leave plugs and corresponding gaps in the spoil pile at intervals requested by landowner to permit vehicular access or movement of livestock to watering and feeding areas. Recommended minimum width of the plug and gap is 3m. Within wildlife habitat areas, leave plugs and gaps at intervals requested by AFLW, Fish and Wildlife Division.

k) Suspend trenching if archaeological or historical sites are identified until permission to proceed is granted by the Archaeological Survey of Alberta.

l) Where blasting is necessary, conduct operations in accordance with Explosives Safety Regulations to protect workers and the local public. Obtain a blasting permit and forewarn the local public prior to initiation of blasting activities. Utilize blasting mats to prevent damage from fly-rock. Immediately collect and dispose of fly-rock from the vicinity of residences, highways, utilities, structures, and from cultivated and improved lands. Dispose of blasting refuse such as dynamite containers, cartridges, and caps at locations and in a manner approved by local authorities having jurisdiction.

m) If drain tiles are cut, mark the location, cap ends to prevent clogging drains with dirt or debris, and install temporary flume if necessary to maintain drainage.

3. Pipe Laying

a) At locations requested by the landowner, leave a minimum 3m wide gap in pipe joints to permit vehicular access or movement of livestock to watering and feeding areas. Within wildlife habitat areas, leave gaps for wildlife movement as requested by AFLW, Fish and Wildlife Division. The gaps in strung pipe should coincide with gaps left in topsoil and spoil piles, snow windrows, trench plugs, and continuous welded sections.

b) Bend pipe to maximum permissible limits in erodible areas where bending is preferable to grading of the right-of-way.

c) Provide receptacles for proper disposal of welding rods. Spent welding rods should not be left on the ground or in the trench. In high fire hazard areas, shut down welding during high winds. The provision of water trucks, for fire fighting purposes, may be required.

d) Leave gaps in continuous welded sections every 1.6km, or as requested by the landowner or the AFLW, Fish and Wildlife Division, to permit passage of livestock and wildlife.

e) Minimize the length of open trench by lowering-in as soon as possible after welding and coating to reduce interference with landowners, livestock and wildlife.

f) Dewater the trench onto stable surfaces in a manner that does not cause erosion of soils or sedimentation of watercourses.

4. Backfilling
   - a) Minimize the length of open trench by backfilling immediately after lowering-in.
   - b) Backfill subsoil prior to replacing topsoil. Do not use topsoil for padding the pipe. Keep the backfill free of wood, skids, garbage and other construction debris.
   - c) Confine backfill activities to the construction right-of-way. To prevent damage off of the right-of-way, use Mormon board, backhoe or Gradall where bulldozers do not have sufficient working space. An auger or similar machine is useful to break up heavy clods or semi-frozen soils.
   - d) Leave the top 0.3m of trench free of rocks on cultivated lands to prevent interference with farm implements.
   - e) Compact the backfilled subsoil, if feasible, as described in Figure 6.7.
   - f) Roach the trench sufficiently to compensate for settlement and minimize changes in natural drainage patterns as described in Figure 6.8.
   - g) Install trench breakers constructed of sandbags (Figures 6.9a and 6.9b), bentonite, urethane foam, or other compacted impervious materials. Breakers force groundwater seepage along the pipeline trench to the surface and are useful on steep slopes, adjacent to watercourses, edges of muskegs, and on other similar sites. Determine the location of trench breakers by on-site investigation considering potential for subsurface flow and degree of slope. A conservative rule of thumb is to adjust the spacing so that the top of the breaker is at the same elevation as the bottom of the uphill breaker. Mark location of trench breaker prior to backfilling to facilitate correct placement of diversion berm immediately downslope of breaker.
   - h) Install subdrains to divert shallow groundwater flow from the right-of-way and to improve slope stability (see Figure 6.10).
   - i) In irrigated areas, repair any drainage tile cut during trenching or crushed by heavy equipment.
   - j) Recontour the right-of-way to approximate preconstruction profile and replace sidehills or other areas which have been graded. Where this is not technically feasible due to risk of ovalling the pipe or failure of fill on slopes, recontour to grades not exceeding 3:1 or as advised by a geotechnical engineer.
   - k) Restore all drainage courses and watercourses to original location and to a stable condition.
   - l) Pick rocks prior to topsoil replacement on gravelly phased cultivated soils. The density and average size of rocks picked should be no more than that existing on adjacent lands.
   - m) Spread topsoil evenly over stripped portions of the right-of-way. Do not grade the right-of-way to obtain replacement topsoil; utilize only topsoil previously salvaged. Frozen topsoil is difficult to spread evenly and should not be replaced until the ditch and topsoil have thawed. Topsoil replacement should cease during wet weather or high winds to prevent loss of topsoil (see Figures 6.6a to d).

6.3.2.6 Testing

Construction and sizing pigs are propelled through the pipeline by compressed air to clean the pipe and check for internal damage. Damaged pipe is daylighted and repairs are made. The pipeline is then pressurized for a specified time in excess of the designed operating pressure. Typical test media include water, methanol, air, and inert gases. During winter, the water is heated or a freezing depressant is added. Any failures are daylighted and repairs made. Following a successful test, a slug of methanol may be injected to dry the pipeline prior to putting the line into service.

Although the testing stage is often of minor concern, significant environmental impacts may occur, particularly if pipe failures and repairs are frequent or if they occur at sensitive locations such as water crossings.

The following guidelines should be observed:

1. Use safe and proper procedures for testing operations. Post warning signs and advise the public of danger.
2. In the event of a test failure, have sufficient workers and equipment available on site to repair any rupture, leak or erosion. Stabilize the site before hydrostatic testing is resumed. Appropriate protection measures should also be implemented when daylighting and repairing the pipe following pig runs.
3. Prior to lowering-in, pre-test pipe sections to be installed at watercourses and other sensitive environmental locations. This will avoid major impacts involved with daylighting and making repairs.
4. If feasible, utilize alternatives to natural water bodies as a source of hydrostatic test water. If air testing is not feasible, preferred sources and disposal locations for hydrostatic testing are industrial water supplies (i.e. gas plant or refinery) and tankage trucked to the site. See guidelines 5 to 10 if hydrostatic testing from natural water bodies (streams, lakes or sloughs) is carried out.
5. Select withdrawal sources which have sufficient quantity and quality of water required for testing purposes. Damming of small watercourses or linking sloughs together via new drainage ditches should only be done as a last resort. Avoid locating test sites on steep slopes or muskeg. Follow the conditions, including proper notification of concerned parties, on the Licence to Divert Water obtained from Alberta Environment.
6. Isolate test pumps and water heaters from water bodies with an impermeable lined dyke or depression to prevent spills of fuel or lubricants from entering a water body. To minimize erosion, ensure that both the fill and the discharge lines are free of leaks. Activate the contingency plan when spills occur. Screen intakes in accordance with guidelines prepared by AFLW, Fish and Wildlife Division.
7. Do not exceed permitted withdrawal rates, nor 10% of the flow or volume of the water source.
8. Select dewatering sites which are more than 2km upstream of public water intakes. If possible, dewater back into the original source. Do not discharge water taken from one major drainage basin such as the Athabasca (which drains to the Arctic Ocean) into another basin such as the North Saskatchewan (which drains to Hudson's Bay). This will prevent the introduction of foreign aquatic organisms.
9. Water returned to natural water bodies should be of sufficient quality to avoid serious pollution problems. Discharged water should be no more than 2°C warmer or colder than the receiving water body. Contact the Chief Fisheries Officer of Alberta Fish and Wildlife and the Standards and Approvals Division of Alberta Environment for procedures when handling discharge water containing bacteriocides, oxygen inhibitors or corrosion inhibitors. The test water may require a 24 hour bioassay or other quality tests prior to discharge.
10. Dewater the pipeline in a manner which will prevent soil erosion and damage to the beds and banks of water bodies. On large water bodies, arc the discharge pipe to oxygenate the water and dissipate erosive energy. On smaller water bodies, dissipate the erosive energy, and dewater onto stable, well vegetated land.
11. Recover in tankage all methanol, ethylene glycol, and water contaminated by freezing depressants. Do not allow contaminants to enter natural water bodies.
12. On agricultural soils, prior to testing and daylighting, strip topsoil from areas to be disturbed.

6.3.2.7 Contingency Planning During Construction

Contingency planning requires that emergency plans and procedures be prepared that can be put into action quickly should unexpected events occur.

Poor contingency planning can result in delayed or ineffective response to unexpected events. In turn, this delay could result in short-term and long-term environmental impacts, and threats to public safety and convenience. Working on unstable ground can cause serious surface disturbance; working during wet weather can reduce soil capability for agriculture and may result in the unacceptable sedimentation of aquatic habitats. The spreading of fires from the right-of-way and the accidental release of toxic substances to the air, water, and soil can have serious environmental and public safety implications.

The following guidelines regarding protection measures should be observed:

1. Prepare contingency plans prior to construction. Make construction personnel aware of their required response to potential problems. Act quickly as required.

2. If a winter thaw causes insufficient frost depth, skip over localized low frost areas or use alternative construction procedures such as swamp mats, log corduroy, rip-rap or filter fabric. When the problem becomes widespread, postpone construction until soils refreeze or dry to avoid significant terrain disturbance on the right-of-way and damage to local roads. Employ temporary erosion control measures as required to protect the right-of-way during break-up. Respect all road bans.

3. In the event of accidental fire, activate the fire contingency plan. The risk of accidental fire can be reduced by making all personnel aware of proper disposal of cigarette butts and by forbidding any fires on the right-of-way when the fire hazard is extreme. In addition, install spark arrestors on construction equipment and vehicles. Maintain exhaust and engine systems in good repair and free of dried grass and other combustibles. The fire contingency plan should provide for an effective fire observation and detection system, and should ensure that construction crews have fire fighting equipment on hand capable of controlling any fire that may occur as a result of their activities. In addition, train a core fire fighting crew with authority to organize construction crews into fire fighting squads. Report any fires immediately to the Alberta Forest Service or landowner and, upon request, make all equipment and personnel available to control the fire.

4. During the onset of wet weather and saturated soils, suspend equipment travel on the right-of-way to minimize topsoil and subsoil compaction, rutting, loss of organic matter, and mixing with subsoil. Indications of excessively wet soils include: wheel slip, build-up of mud on tires and cleats, formation of ruts and ponding. Equipment travel should resume only after soils are sufficiently dry or frozen.

5. If soil drifting causes loss of topsoil and reduced visibility, take control measures. These measures may include watering down the working site and suspending topsoil stripping and backfill operations during high winds.

6. Should excessive flows in watercourses occur due to winter thaw or wet weather, postpone the water crossing until flows drop to acceptable levels. Flumes or dams placed in watercourses should be removed until flows drop.

7. When spills of construction fluids occur, a contingency plan should be quickly put into action to contain and clean up the spill. All fuel and service vehicles should carry a minimum of 10kg of suitable commercial sorbent material for use on small fuel or oil spills. Mobile construction equipment should not be serviced or refuelled within 100m of watercourses to prevent water pollution. Assistance with larger spills can be provided by the appropriate oil spill cooperative.

8. If H_2S or other toxic substances are accidentally released, the appropriate emergency response plan should be activated immediately.

9. In the event that any previously unidentified archaeological or heritage sites are discovered during construction, stop work until the site is examined by a qualified archaeologist and permission to proceed is received from the Archaeological Survey of Alberta.

6.3.2.8 Cleanup And Site Restoration

Cleanup is normally the final stage of the project. Garbage and debris are removed from the right-of-way and final erosion control structures are installed. At this time, watercourse crossing structures and survey stakes are removed, fences and gates repaired or replaced, topsoil prepared for seeding, and the right-of-way reseeded. When mainline construction occurs in the winter or late fall, final cleanup is delayed until spring, or as soon as possible thereafter.

A good cleanup effort is essential to repair construction damage and to eliminate long-term reclamation problems. A proper cleanup is essential for good relations with the landowner. Poor cleanup can result in a littered, erodible right-of-way adversely affecting agricultural, recreational, and other land uses, as well as fish and wildlife habitat. Reduced agricultural capability may result from trench settlement and ponding, litter, soil compaction, rocks left on or near the surface, poorly restored drainage channels, and improper seed bed preparation. Poorly stabilized banks and slopes leading to watercourses may increase stream silt loads and create long-term impact on fish populations and habitat. Wildlife can be adversely affected by long line of sight or reduced food sources if the right-of-way is not revegetated following completion of construction.

For guidelines on cleanup and restoration, the handbook User should refer to Section 8.4.

6.3.2.9 Stream And Water Body Crossings

Water crossings involve three activities. First, construction equipment must cross the watercourse via fords, bridges or other structures. Second, the pipe is installed under the bed of the watercourse with sufficient cover to protect it from scouring. Normally, the trench is excavated through the flowing watercourse with a backhoe, clam or dragline and the trench spoil is piled on the banks or in the watercourse. The pipe is then weighted and lowered or pulled into the trench. Third, the trench is backfilled and the banks restored. In some cases, alternative methods are used to install the pipe without excavating a trench in the watercourse. These alternatives are known as dry crossing methods.

Water crossings, particularly those using wet crossing methods, are one of the major environmental concerns associated with pipeline construction. Poor construction schedules or inadequate protection measures can damage fish habitats and harm aquatic life, as well as interfere with downstream water users. Pipeline construction may cause alteration of stream substrates, physical or chemical changes in water quality such as sediment loading or introduction of toxic materials, interruption of stream flow, or blockage of fish movements. Many of these impacts are relatively short-term in that the impact ceases soon after completion of the crossing. However, long-term impacts may occur if the adjacent right-of-way is not revegetated or if the banks are not properly restored.

For guidelines on stream crossings the handbook User should refer to Section 8.2.

6.3.3 SPILL CONTINGENCY PLANS FOR OPERATING SYSTEMS

Contingency plans must be developed for both the construction and operating phases of the project. Contingency plans for construction were addressed in Section 6.3.2.7. Since the effectiveness of any plan is highly dependent upon the degree of personnel and operator training, emphasis should be placed on training personnel and operators. The handbook User should refer to Section 8.9 for detailed guidelines on emergency procedures and contingency plans.

Specific information which should be contained in the spill contingency plan is provided below.

1. The plan should contain concise information to assist operating personnel in the event of a pipeline emergency.

   The plan should include the following:

   a) a definition of the emergencies covered by the plan
   b) the procedures for handling and investigating Leakage Reports
   c) the procedures for alerting company personnel and affected outside parties
   d) a clear definition of the responsibilites of everyone involved

e) guidelines for reaction and control, including shutdown procedures, leak location, leak isolation, spillage containment, watercourse protection, etc.

f) methods for immediate corrective action including spill control and containment, restoration and rehabilitation of the affected resource

g) guidelines for the protection of operating personnel and the general public

h) safe work procedures for pipeline repair

i) guidelines for post-repair inspection and returning the line to service

j) maps and descriptions of each subsection of the pipeline system, including procedures for isolation and depressurization

k) guidelines for public relations and the dissemination of information

l) a telephone contacts summary.

2. The contingency plans and their methods of implementation, should be reviewed and, if necessary, updated at least once per year.
3. The Canadian Petroleum Association's "Alberta Oil Spill Co-operative Contingency Plan" (CPA, 1976) should be made available to each operator.
4. In the event of an oil pipeline rupture, the spill contingency plan must be implemented immediately. By so doing, the affected surface area can be limited, and cleanup and soil reclamation procedures implemented. However, these procedures must be developed on a site-specific basis. Any spill over $2m^3$ must be reported to the ERCB's Local Area Offices (see Figure 2.9).
5. If the pipeline crosses an urban area a special contingency plan should be developed.

For spill contingency plans, the handbook User should also refer to a document entitled "Recommended Practice for Liquid Petroleum Pipeline Leak Prevention and Detection in the Province of Alberta". This document is available from the Canadian Petroleum Association, phone: (403) 269-6721.

The document provides guidelines for:

1. Pipeline corrosion control
2. Overpressure protection
3. Pressure loss detection
4. External pipeline damage prevention
5. Right-of-way inspection
6. River or stream crossing inspection
7. Pipeline maintenance and repair
8. Procedures for calculating a material balance.

Finally, the handbook User should refer to Section 5.3.12 on spill prevention and containment and Section 8.4 on spill area reclamation.

6.3.4 RIGHT-OF-WAY MAINTENANCE AND WEED CONTROL

The right-of-way must be regularly inspected and maintained to:

1. restore areas which have been damaged by erosion;
2. ensure a vegetative cover is established within one full growing season;
3. prevent the growth of noxious weeds, as stipulated in the Land Surface Conservation and Reclamation Act, Section 39.

Methods of erosion control are provided in Section 8.5. Reclamation methods for establishing a vegetative cover are discussed in Section 8.4.

See Section 8.11 (Pesticides, Herbicides and Chemical Handling) for information on weed control.

6.3.5 OPERATION AND MAINTENANCE

Section 49 of the Pipeline Regulation (AR 122/87) requires pipeline operators to develop and maintain a manual of operating and maintenance procedures. Guidelines are as follows:

1. Regular pipeline patrols should be conducted to observe: the conditions on and adjacent to the pipeline right-of-way, indications of leaks, construction activity not related to the pipeline system and any other factors which may affect the environment, safety and/or operation of the pipeline system. Weather, terrain, size of line and operating pressures are some of the factors which should be used to determine the frequency of patrols. Multiple use areas of right-of-way, such as highway and railway crossings, and stream crossings should undergo more frequent patrols.

2. The operator should prepare contingency plans for pipeline repair activities where sensitive terrain, vegetation, wildlife population or aquatic systems may be affected. The contingency plans should identify procedures for:

   a) pipeline repairs requiring immediate deployment of heavy machinery

   b) use of low impact procedures for repairs during sensitive periods with permanent repairs to be made subsequently in non-sensitive periods

   c) scheduling routine maintenance activities for non-sensitive periods.

3. Following any repair activity, procedures necessary to stabilize and revegetate disturbed terrain should be implemented.

4. Settling basins should be maintained and cleaned of slag, sand and debris.

5. In the first summer following construction, stream crossings should be inspected weekly during the first month after break-up, and monthly thereafter until freeze-up to detect erosion and assess adequacy of erosion control structures. Crossings should be inspected quarterly for at least the next two years, and then yearly during annual peak runoff periods for the life of the pipeline.

Information available from the ERCB on operation and matintenance can be found in IL 85-2: Leak Prevention and Detection.

Additional information available on operation and maintenance includes:

1. **Recommended Practice For Liquid Petroleum Pipeline Leak Prevention and Detection In The Province of Alberta**

   Information: Document includes guidelines on pipeline corrosion control, pressure loss detection, pipeline damage prevention and right-of-way inspection, etc.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

2. **Pipeline Operation Courses**
   a) Welding Inspectors
   b) Industrial Radiographic Interpretation
   c) Liquid Pipeline Hydraulics

   Available: Petroleum Industry Training Service
   phone: (403) 436-1445.

6.3.6 ABANDONMENT

Sections 60 to 69 of the Pipeline Regulation (AR 122/87) describe the procedures that must be followed for the take-up, removal or abandonment of pipelines. ERCB consent is required for all pipelines and a D & R approval issued by Alberta Environment is required for the abandonment of a regulated pipeline. The handbook User should refer to Section 8.10 on abandonment and decommissioning.

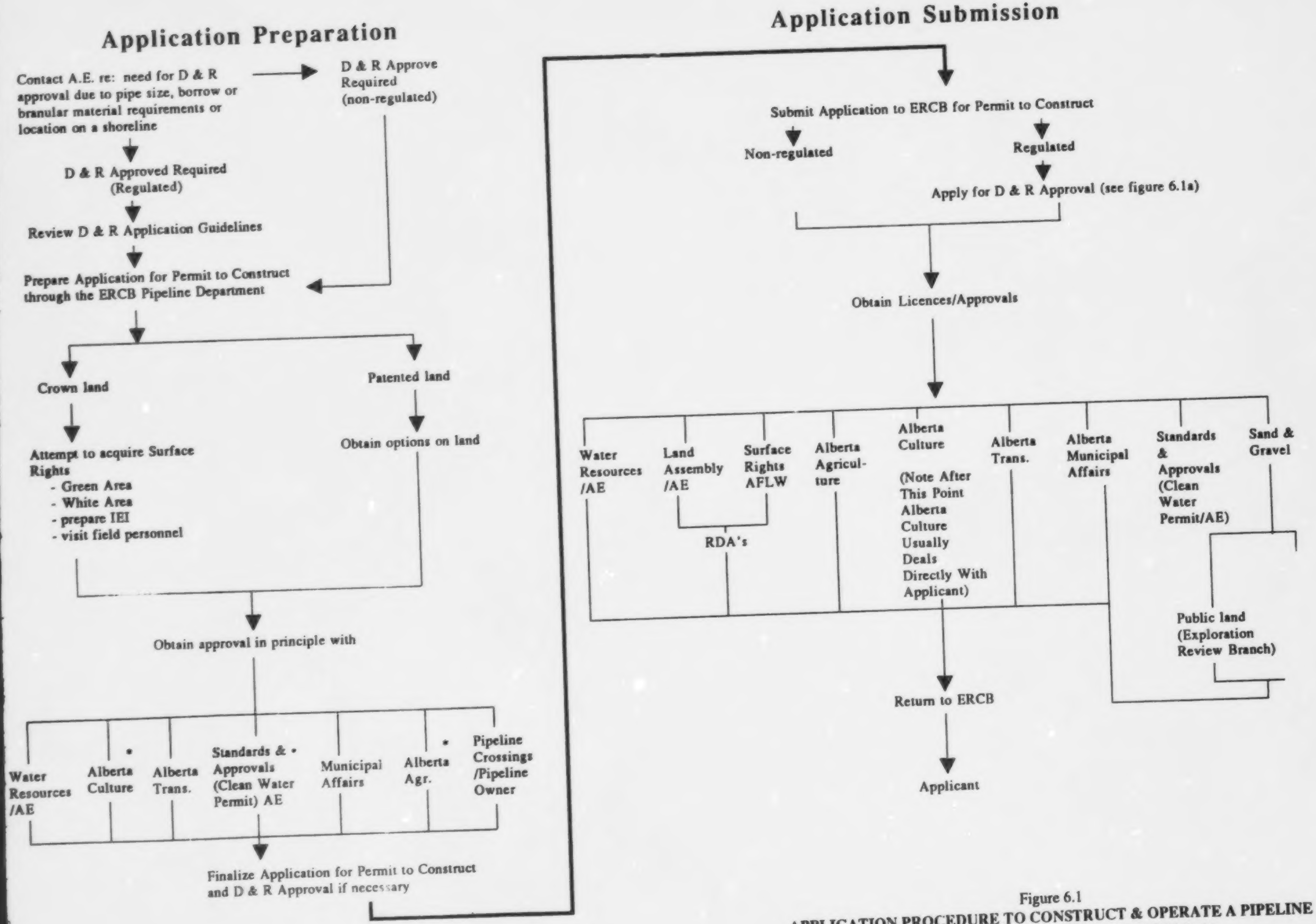

Application Preparation
Contact A.E. re: need for D & R approval due to pipe size, borrow or branular material requirements or location on a shoreline
D & R Approve Required (non-regulated)
D & R Approved Required (Regulated)
Review D & R Application Guidelines
Prepare Application for Permit to Construct through the ERCB Pipeline Department
Crown land
Patented land
Attempt to acquire Surface Rights
- Green Area
- White Area
- prepare IEI
- visit field personnel
Obtain options on land
Obtain approval in principle with
Water Resources /AE
Alberta Culture *
Alberta Trans.
Standards & Approvals (Clean Water Permit) AE *
Municipal Affairs
Alberta Agr. *
Pipeline Crossings /Pipeline Owner
Finalize Application for Permit to Construct and D & R Approval if necessary
Application Submission
Submit Application to ERCB for Permit to Construct
Non-regulated
Regulated
Apply for D & R Approval (see figure 6.1a)
Obtain Licences/Approvals
Water Resources /AE
Land Assembly /AE
Surface Rights AFLW
RDA's
Alberta Agricul- ture
Alberta Culture
(Note After This Point Alberta Culture Usually Deals Directly With Applicant)
Alberta Trans.
Alberta Municipal Affairs
Standards & Approvals (Clean Water Permit/AE)
Sand & Gravel
Public land (Exploration Review Branch)
Return to ERCB
Applicant

Figure 6.1
APPLICATION PROCEDURE TO CONSTRUCT & OPERATE A PIPELINE
(reference: David Bromley Engineering (1983) Ltd.)

* APPROVAL GENERALLY NOT REQUIRED FOR NON-REGULATED PIPELINES

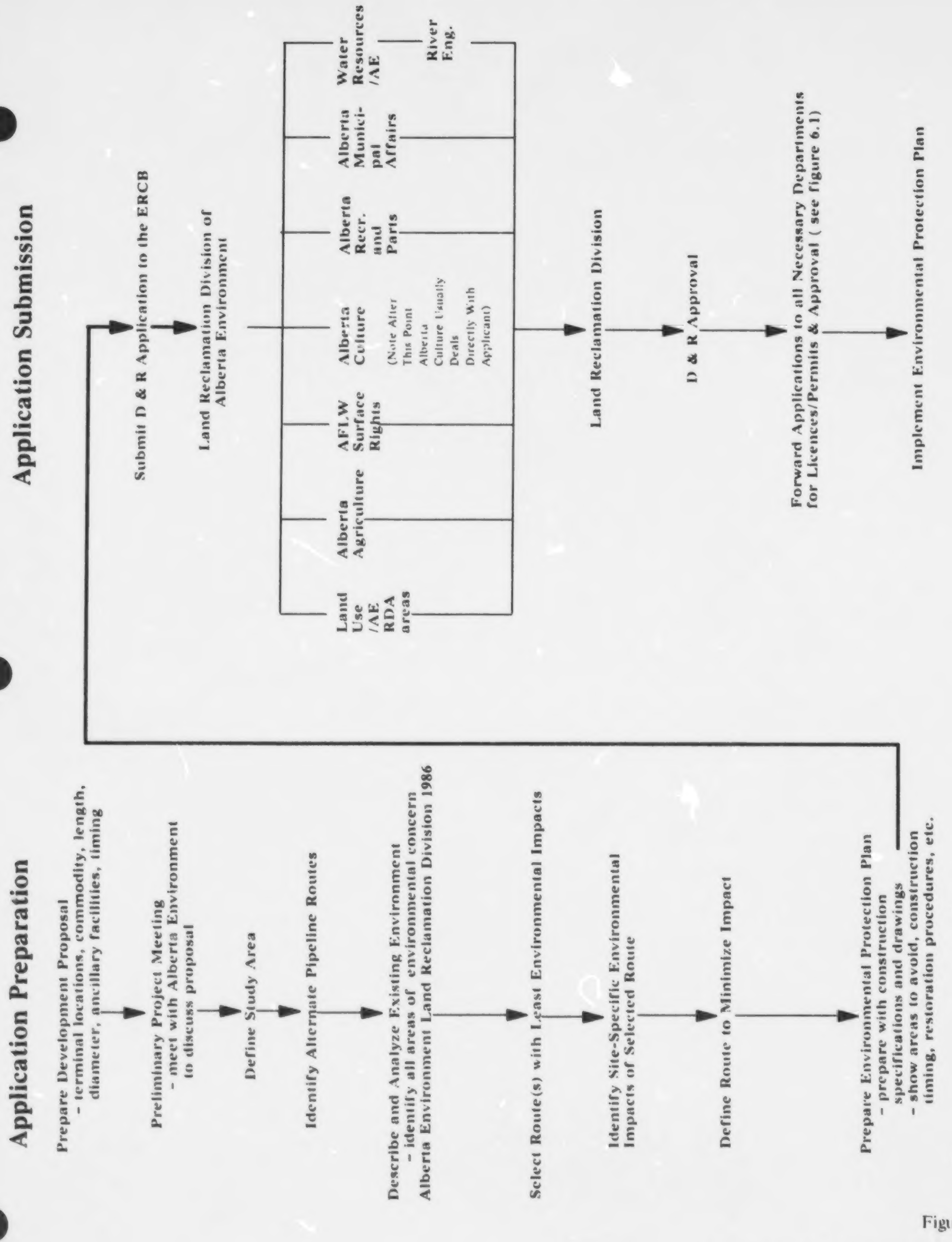
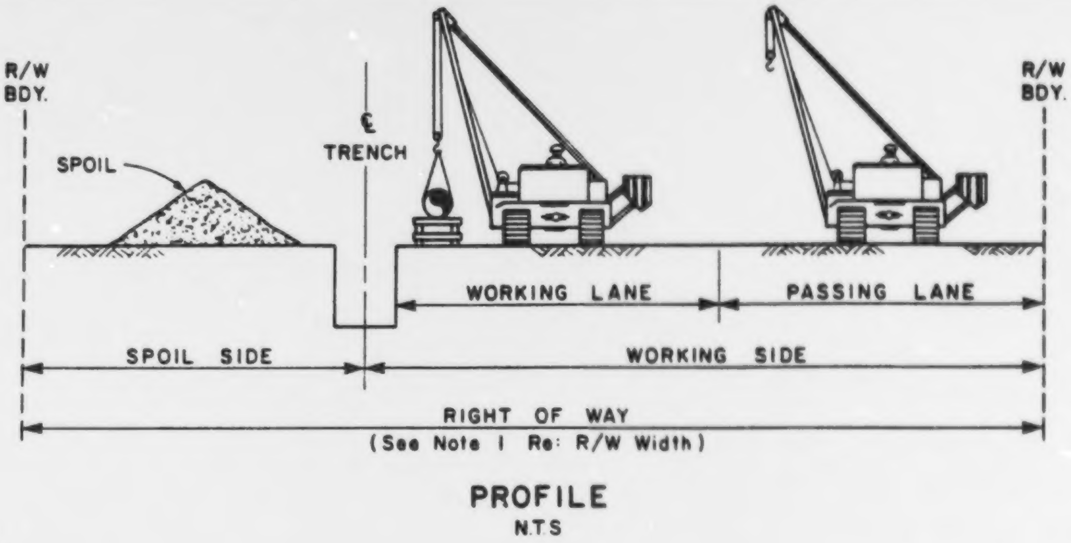

Application Preparation
Prepare Development Proposal
- terminal locations, commodity, length, diameter, ancillary facilities, timing
Preliminary Project Meeting
- meet with Alberta Environment to discuss proposal
Define Study Area
Identify Alternate Pipeline Routes
Describe and Analyze Existing Environment
- identify all areas of environmental concern
Alberta Environment Land Reclamation Division 1986
Select Route(s) with Least Environmental Impacts
Identify Site-Specific Environmental Impacts of Selected Route
Define Route to Minimize Impact
Prepare Environmental Protection Plan
- prepare with construction specifications and drawings
- show areas to avoid, construction timing, restoration procedures, etc.
Application Submission
Submit D & R Application to the ERCB
Land Reclamation Division of Alberta Environment
Land Use /AE RDA areas
Alberta Agriculture
AFLW Surface Rights
Alberta Culture
(Note After This Point Alberta Culture Usually Deals Directly With Applicant)
Alberta Recr. and Parks
Alberta Munici-pal Affairs
Water Resources /AE
River Eng.
Land Reclamation Division
D & R Approval
Forward Applications to all Necessary Departments for Licences/Permits & Approval (see figure 6.1)
Implement Environmental Protection Plan

Figure 6.1a

APPLICATION PROCEDURES
DEVELOPMENT & RECLAMATION (D & R) APPROVALS

(Reference: David Bromley Engineering (1983) Ltd..)


R/W BDY.
SPOIL
℄ TRENCH
R/W BDY.
WORKING LANE
PASSING LANE
SPOIL SIDE
WORKING SIDE
RIGHT OF WAY
(See Note 1 Re: R/W Width)
PROFILE
N.T.S

Notes

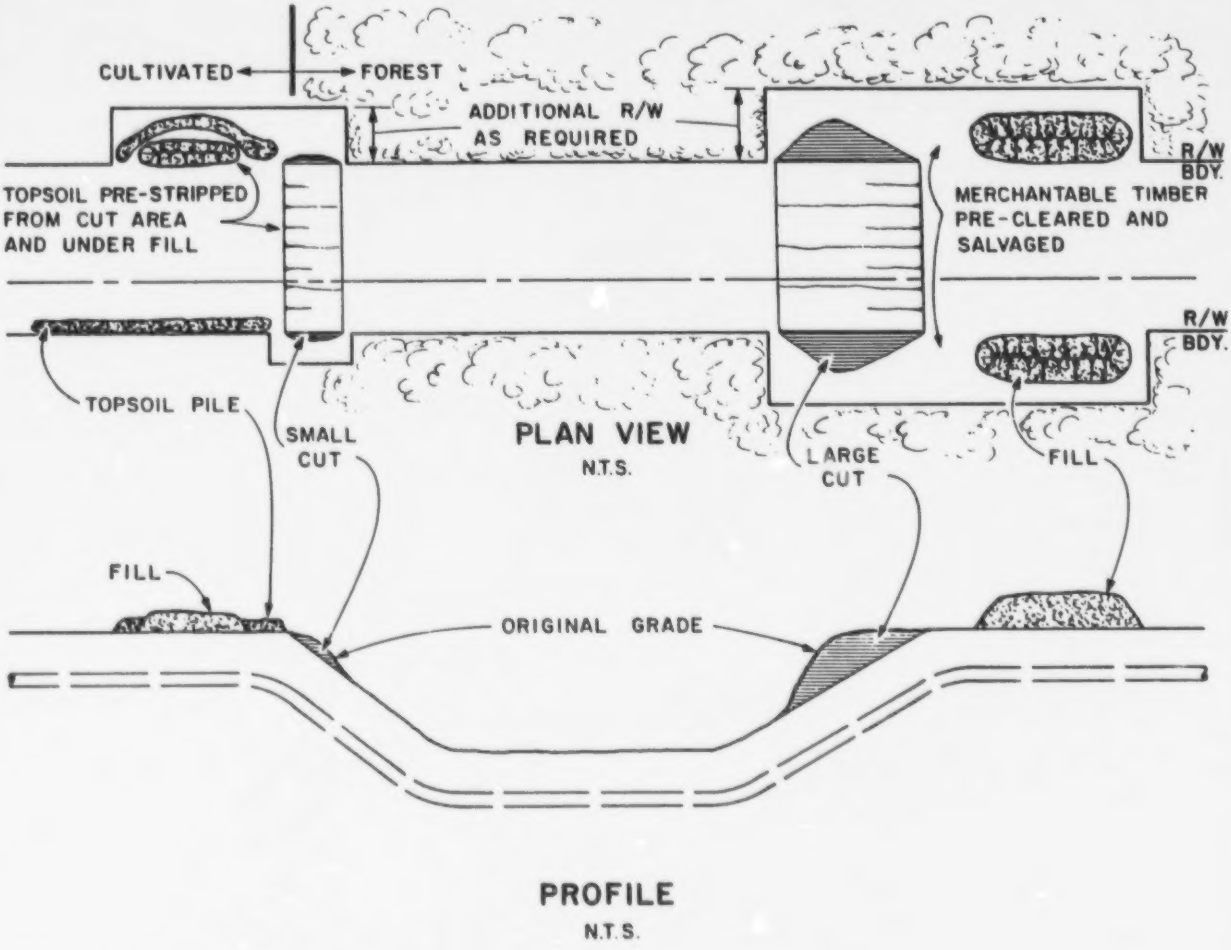
1. Prior to construction, determine standard right-of-way width and locations requiring additional right-of-way. Merchantable timber can then be cleared and salvaged, and topsoil can be stripped and stockpiled separately from spoil.

Right of Way Width Considerations

	Less R/W	More R/W
A) No. of pipelines		
- single	X	
- multiple		X
B) Pipe diameter		
- small inch	X	
- big inch		X
C) Working space		
- crossings		X
- expansion loops		X
- passing lane		X
D) Slash disposal		
- burning	X	
- total rollback		X
E) Topsoil stripping		
- width - none	X	
- full R/W		X
- depth - 6 cm	X	
- 30 cm		X
F) Grading		
- none	X	
- extensive		X
G) Trench material		
- clay	X	
- sand		X
- rock (blasting)		X
H) Depth of cover		
- 1 m	X	
- 3 m		X
I) Water table		
- low	X	
- high		X
J) Trenching Equipment		
- wheel	X	
- hoe		X

Figure 6.2 PIPELINE RIGHT-OF-WAY

(Reference: Alberta Environment)

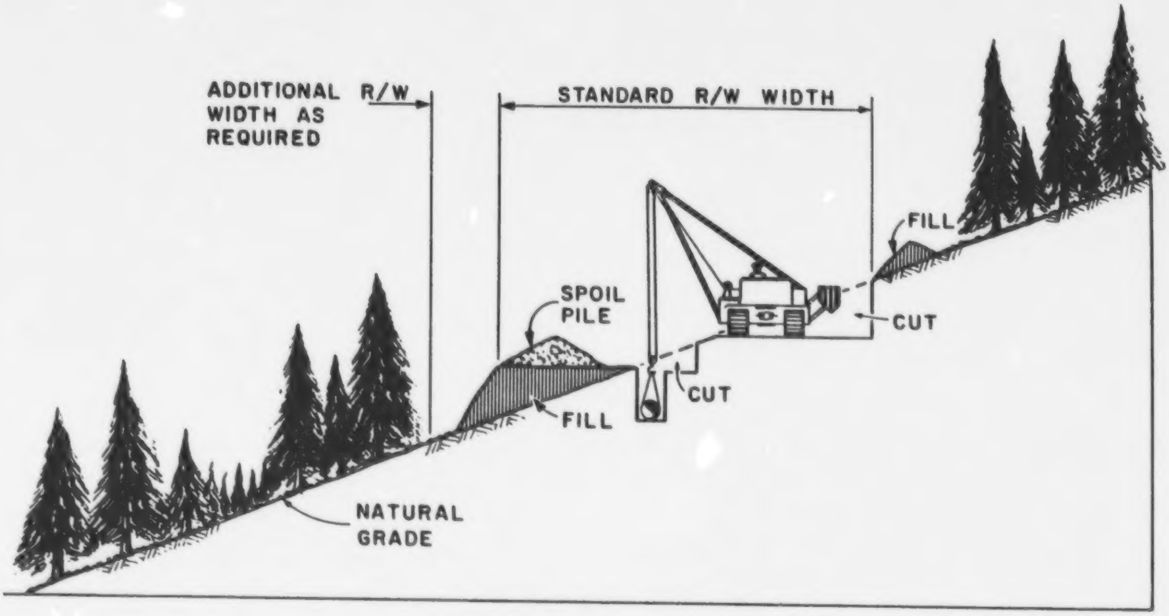

CULTIVATED
FOREST
ADDITIONAL R/W AS REQUIRED
TOPSOIL PRE-STRIPPED FROM CUT AREA AND UNDER FILL
MERCHANTABLE TIMBER PRE-CLEARED AND SALVAGED
R/W BDY.
R/W BDY.
TOPSOIL PILE
SMALL CUT
PLAN VIEW
N.T.S.
LARGE CUT
FILL
FILL
ORIGINAL GRADE
PROFILE
N.T.S.

Notes

1. Grade only as necessary to provide adequate surface for construction equipment and to allow overbends and sagbends to be made within permissible bending limits. On winter projects, use snow to smooth out the working side if possible.
2. Identify areas where additional right-of-way is required to accommodate cuts and fills. Obtain landowner approval. Salvage merchantable timber and topsoil.
3. Slope cuts sufficiently to minimize instability and resultant erosion and pipe integrity problems.
4. Stockpile fill in areas where it can be easily recovered (usually uphill) and where natural drainage is not blocked.
5. Do not stockpile fill in a manner which overloads slopes causing slope failure. Obtain advice from a geotechnical engineer.
6. Replace cuts and recontour slopes to maximum 3:1 grade unless otherwise directed by geotechnical engineer.
7. Employ erosion control measures such as breakers, cross ditches and berms, and revegetation.

Figure 6.3 GRADING THE RIGHT-OF-WAY

(Reference: Alberta Environment)


ADDITIONAL R/W WIDTH AS REQUIRED
STANDARD R/W WIDTH
FILL
SPOIL PILE
CUT
CUT
FILL
NATURAL GRADE

Notes

1. Two-tone the right-of-way to limit the need for cuts and additional right-of-way on steep sidehills.
2. Clear and stake additional right-of-way to allow for extra spoil.
3. Ensure side boom tractors are equipped with boom extenders and counterweights if required.
4. Use backhoe to assist bulldozers with replacing cuts. Recontour to maximum 3:1 grade unless otherwise directed by geotechnical engineer.
5. Employ erosion control measures such as breakers, cross ditches and berms, and revegetation.

Figure 6.4 TWO - TONING THE RIGHT-OF-WAY

(Reference: Alberta Environment)

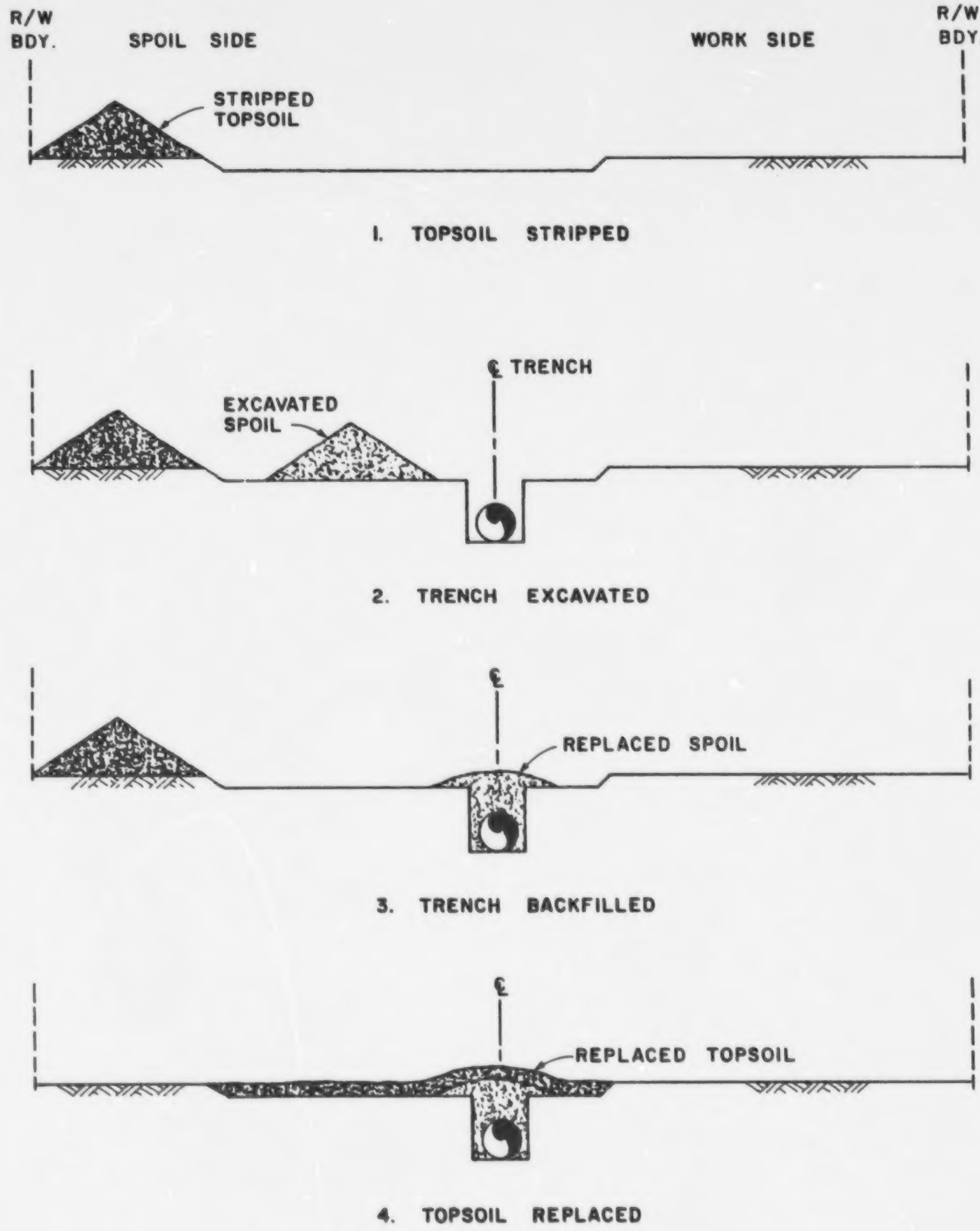
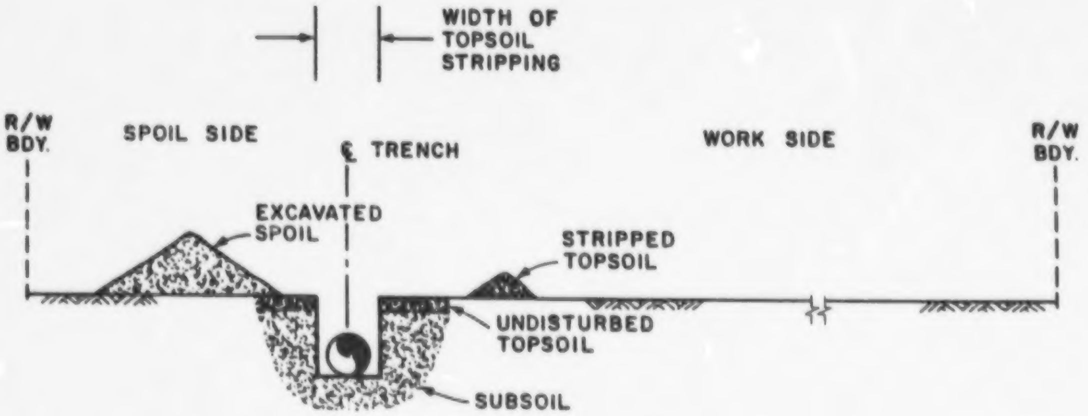

R/W BDY.
SPOIL SIDE
WORK SIDE
R/W BDY.
STRIPPED TOPSOIL
1. TOPSOIL STRIPPED
℄ TRENCH
EXCAVATED SPOIL
2. TRENCH EXCAVATED
℄
REPLACED SPOIL
3. TRENCH BACKFILLED
℄
REPLACED TOPSOIL
4. TOPSOIL REPLACED

Figure 6.5 SEQUENCE OF TOPSOIL HANDLING

(Reference: Alberta Environment)


WIDTH OF TOPSOIL STRIPPING
R/W BDY.
SPOIL SIDE
℄ TRENCH
WORK SIDE
R/W BDY.
EXCAVATED SPOIL
STRIPPED TOPSOIL
UNDISTURBED TOPSOIL
SUBSOIL

Notes

1. Remove topsoil from the trench line and store on work side adjacent to the trench. Stripped width will be approximately 0.8 - 1.2 m. Stored topsoil should be approximately 1.3 m from the trench to allow for subsequent pass of trencher to excavate subsoil material.

2. Excavate subsoil and store on spoil side adjacent to the trench.

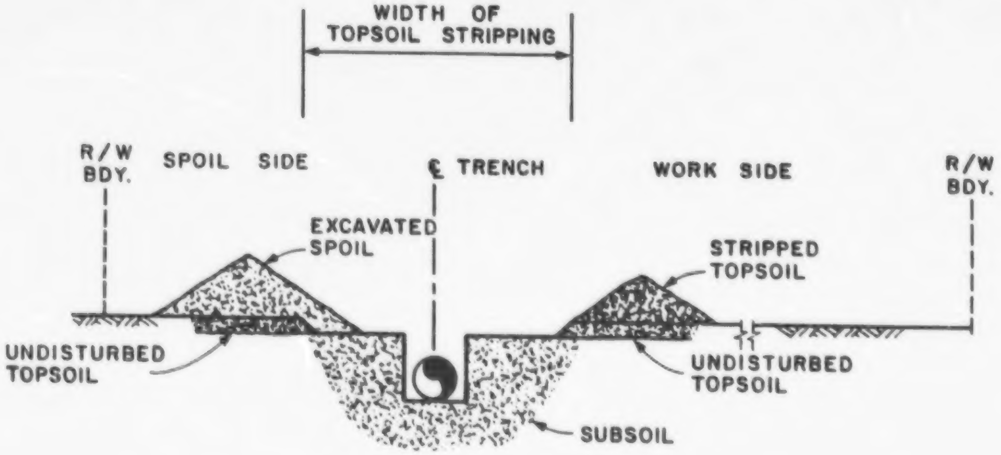
3. Return trench spoil to trench and compact. Minimize scalping of undisturbed sod layer on grassed lands.

4. Return topsoil evenly over the trench line.

5. Alleviate compaction of topsoil over entire right of way on cultivated lands. Reseed with a compatible seed mix and fertilize on grassed lands.

Figure 6.6 (a) TRENCH WIDTH TOPSOIL STRIPPING

(Reference: Alberta Environment)

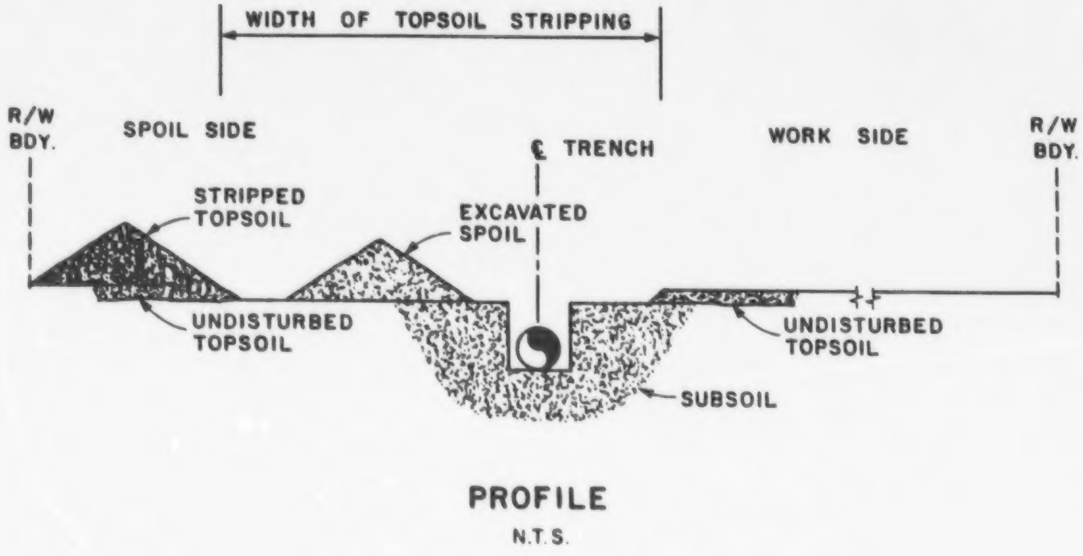

WIDTH OF TOPSOIL STRIPPING
R/W BDY.
SPOIL SIDE
℄ TRENCH
WORK SIDE
R/W BDY.
EXCAVATED SPOIL
STRIPPED TOPSOIL
UNDISTURBED TOPSOIL
UNDISTURBED TOPSOIL
SUBSOIL

Notes

1. Remove topsoil from an area centered over the trench line. Stripped width will be approximately 3 to 3.5 m. Store topsoil on work side adjacent to stripped area. Topsoil can be stored in a pile or spread out over the work side.
2. Excavate trench subsoil and store on spoil side adjacent to trench.
3. Return trench spoil to trench and compact. Feather out excess spoil over stripped area leaving a low roach centered over the trench.
4. Return topsoil evenly over the stripped area.
5. Alleviate compaction of topsoil over entire right-of-way on cultivated lands. Reseed with a compatible seed mix and fertilize on grassed lands.

Figure 6.6 (b) BLADE WIDTH TOPSOIL STRIPPING

(Reference: Alberta Environment)

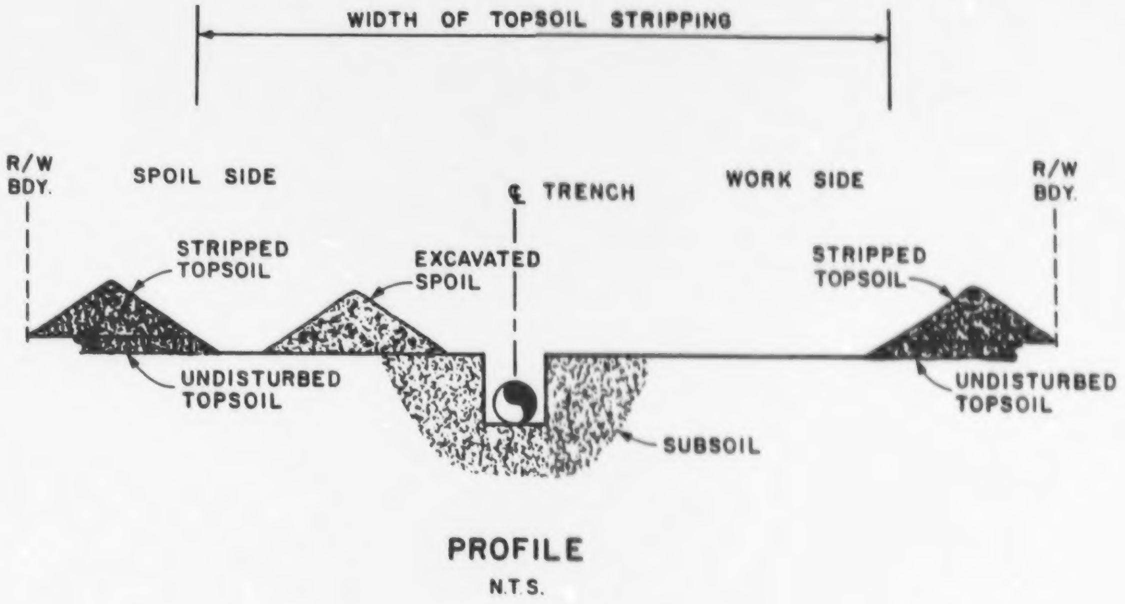

WIDTH OF TOPSOIL STRIPPING
R/W BDY.
SPOIL SIDE
℄ TRENCH
WORK SIDE
R/W BDY.
STRIPPED TOPSOIL
EXCAVATED SPOIL
UNDISTURBED TOPSOIL
UNDISTURBED TOPSOIL
SUBSOIL
PROFILE
N.T.S.

Notes

1. Remove topsoil from over the trench and under the spoil pile. Stripped width will be approximately 6 - 8 m. Store topsoil on spoil side adjacent to stripped area.
2. Excavate trench subsoil and store on spoil side adjacent to trench. Allow a 1 m separation between the topsoil pile and the trench spoil.
3. Return trench spoil to trench and compact. Feather out excess spoil over stripped area leaving a low roach centered over the trench. Alleviate compaction of clay rich subsoils over the stripped area.
4. Return topsoil evenly over the stripped area.
5. Alleviate compaction of topsoil over entire right-of-way.

Figure 6.6 (c) TRENCH AND SPOIL AREA TOPSOIL STRIPPING

(Reference: Alberta Environment)

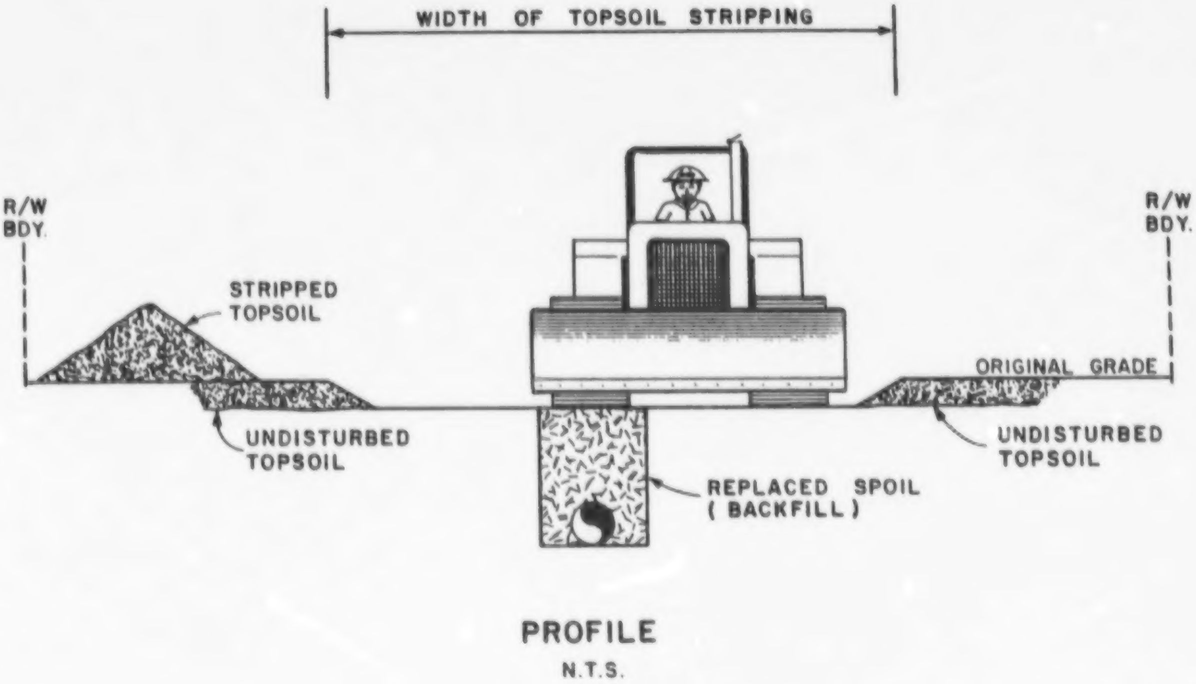

WIDTH OF TOPSOIL STRIPPING
R/W BDY.
SPOIL SIDE
℄ TRENCH
WORK SIDE
R/W BDY.
STRIPPED TOPSOIL
EXCAVATED SPOIL
STRIPPED TOPSOIL
UNDISTURBED TOPSOIL
SUBSOIL
UNDISTURBED TOPSOIL
PROFILE
N.T.S.

Notes

1. Remove topsoil from the trench, spoil storage and work areas. Store topsoil on both sides of the right-of-way adjacent to the stripped area.
2. Excavate trench subsoil and store on spoil side adjacent to the trench. Allow for a 1 m separation between the topsoil pile and the trench spoil.
3. Return trench spoil to trench and compact. Feather out excess spoil over stripped area leaving a low roach centered over the trench. Alleviate compaction of clay rich subsoils over the stripped area.
4. Return topsoil evenly over the stripped area.
5. Alleviate compaction of topsoil over entire right-of-way.

Figure 6.6 (d) TRENCH, SPOIL AND WORK AREA TOPSOIL STRIPPING

(Reference: Alberta Environment)

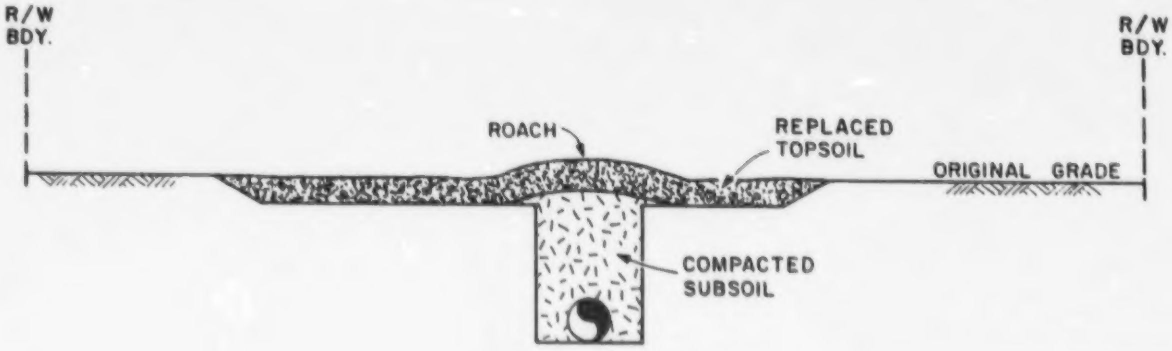

WIDTH OF TOPSOIL STRIPPING
R/W BDY.
R/W BDY.
STRIPPED TOPSOIL
ORIGINAL GRADE
UNDISTURBED TOPSOIL
UNDISTURBED TOPSOIL
REPLACED SPOIL (BACKFILL)
PROFILE
N.T.S.

Notes

1. Compact the backfilled subsoil to minimize settlement except in rocky or muskeg areas. The degree of compaction which can be achieved is limited by soil type, frost and moisture content, depth of cover, pipe strength and insulation, and other factors. Typically, compaction is achieved by a few passes with a crawler tractor. In special cases such as irrigation fields and open cut road crossings, 100% compaction is desirable and requires special equipment and compacting in multiple lifts.
2. Dispose of excess subsoil in locations satisfactory to the landowner and in a manner which will prevent mixing with topsoil.

Figure 6.7 COMPACTION OF BACKFILL

(Reference: Alberta Environment)



PROFILE

N.T.S.

Notes

1. Roach the trench to compensate for anticipated settlement and changes in natural drainage patterns. The height of the roach depends upon land use, the degree of compaction achieved, and soil temperature. Frozen soils require higher roaches than non-frozen soils. In agricultural lands, including forested lands in the yellow area, the roach should be low and wide (unfrozen case) to facilitate topsoil replacement. A higher roach is acceptable in forested lands in the green area, provided drainage and wildlife are unaffected. Typical values for roaching of representative soil types are presented below. The higher numbers in the range represent the worst case (frozen or clods).

Type of Backfill	Percent Roach (%R)
Blasted Rock	0 - 5
Sand & Gravel	5 - 10
Sand	8 - 15
Silty Sand	10 - 15
Silt	10 - 20
Clay	10 - 25
Organic (Muskeg)	50 - 100%

R = %R x D Where R = height of roach
D = depth of trench

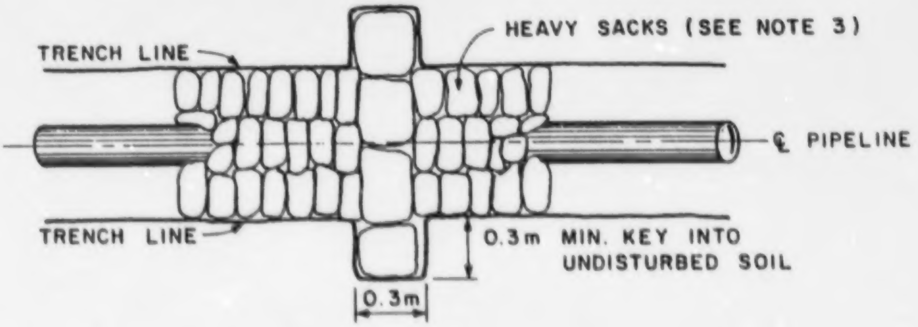
2. Leave periodic gaps in roach (e.g. 250 m), at all obvious drainage courses and at trench breakers allow for surface run-off. These gaps may require maintenance the following year to fill in settled areas.

3. Replace topsoil evenly.

Source: Formula adapted from Transcanada Pipelines, 1979.

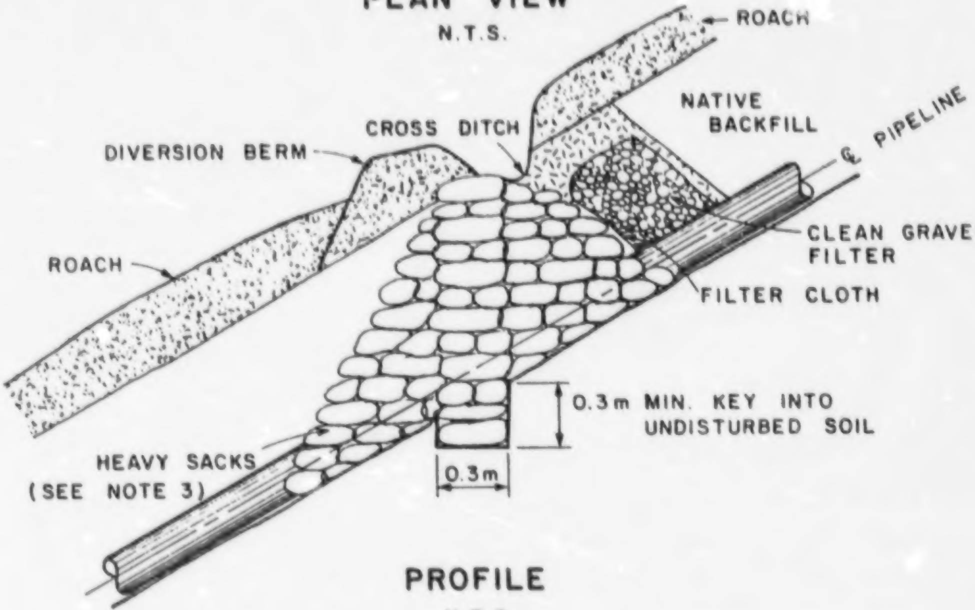
Figure 6.8 ROACHING THE TRENCH

(Reference: Alberta Environment)


HEAVY SACKS (SEE NOTE 3)
TRENCH LINE
℄ PIPELINE
TRENCH LINE
0.3m MIN. KEY INTO UNDISTURBED SOIL
0.3m

PLAN VIEW

N.T.S.


ROACH
NATIVE BACKFILL
CROSS DITCH
℄ PIPELINE
DIVERSION BERM
CLEAN GRAVEL FILTER
ROACH
FILTER CLOTH
0.3m MIN. KEY INTO UNDISTURBED SOIL
HEAVY SACKS (SEE NOTE 3)
0.3m

PROFILE

N.T.S.

Notes

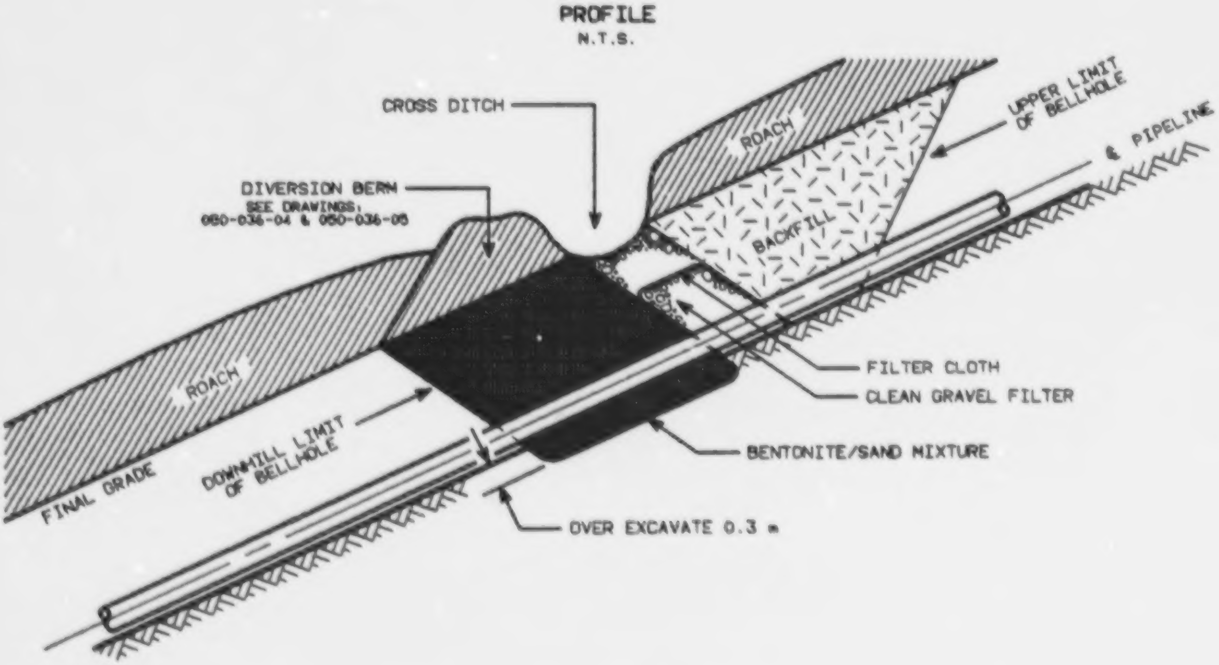
1. Install sack breaker on steep slopes, adjacent to watercourses, edges of muskegs and other similar sites to force seepages to the surface and prevent erosion of padding and backfill material.

2. Fill sacks with earth, clay, sand or cement/sand mixture.

3. Interlock sacks by hand to provide a watertight barrier. Install a polyethylene liner, a bentonite layer or other impermeable material. Key the structure into trench walls and bottom for added stability. Install a clean gravel filter upslope to permit the controlled exit of seepage to the surface. To prevent infiltration of fines into the filter material, wrap in filter cloth. Alternatives to the gravel filter include a wicking material or equivalent.

Figure 6.9 (a) SACK BREAKER

(Reference: Alberta Environment)


PROFILE
N.T.S.
CROSS DITCH
DIVERSION BERM
SEE DRAWINGS,
050-036-04 & 050-036-05
ROACH
UPPER LIMIT OF BELLHOLE
℄ PIPELINE
BACKFILL
ROACH
FILTER CLOTH
CLEAN GRAVEL FILTER
BENTONITE/SAND MIXTURE
DOWNHILL LIMIT OF BELLHOLE
FINAL GRADE
OVER EXCAVATE 0.3 m

Notes

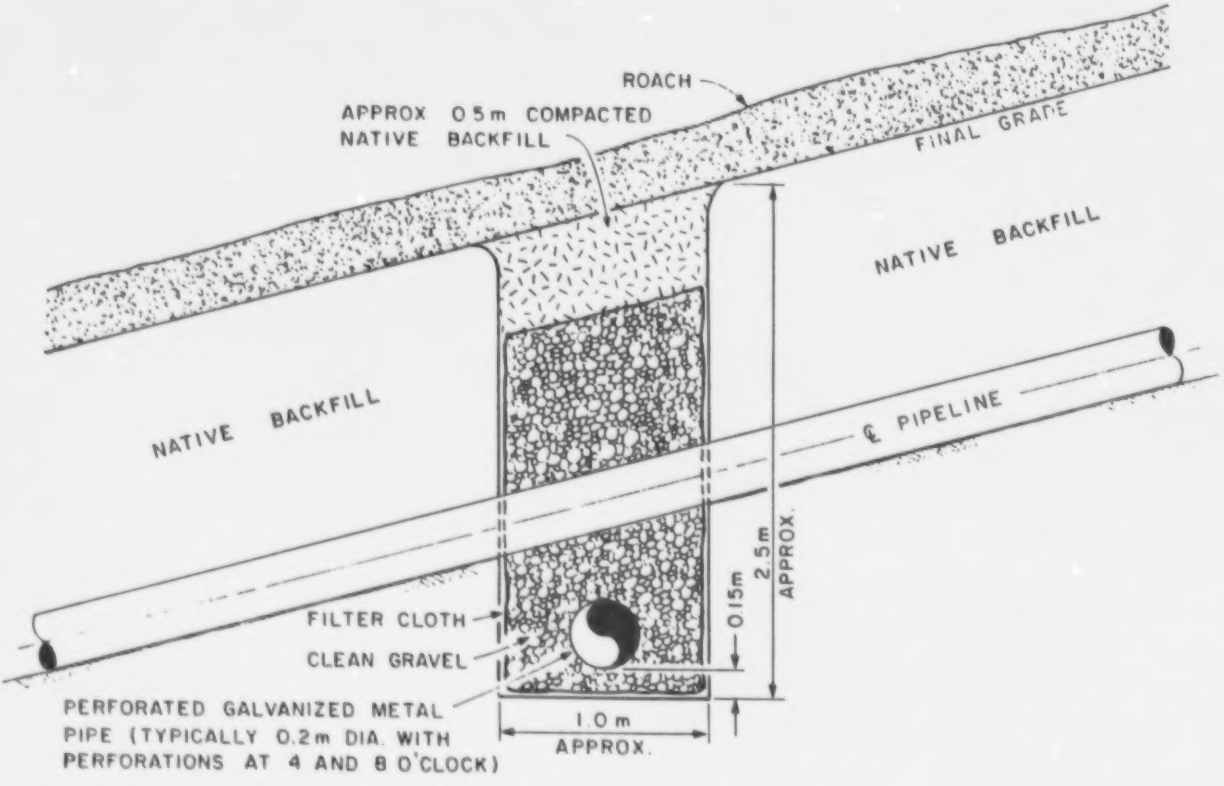
1. Install bentonite and sand ditch blocks on steep slopes, adjacent to watercourses, edges of muskegs, and other similar sites to force water to the surface and prevent erosion of padding and backfill material.

2. Use a 15 - 20% mixture by weight of bentonite with sand. This mixture can be prepared using a truck-mounted concrete mixer. Bentonite should not be used without backup where strength is required.

3. Install a clean gravel filter upslope to permit the controlled exit of seepage to the surface. To prevent infiltration of fines into the filter material, wrap in filter cloth. Alternatives to the gravel filter include a wicking material or equivalent.

Figure 6.9 (b) TYPICAL BENTONITE/SAND DITCH BLOCK

(Reference: Esso, Adapted from Alberta Environment)


ROACH
APPROX 0.5m COMPACTED NATIVE BACKFILL
FINAL GRADE
NATIVE BACKFILL
NATIVE BACKFILL
℄ PIPELINE
2.5m APPROX.
0.15m
FILTER CLOTH
CLEAN GRAVEL
PERFORATED GALVANIZED METAL PIPE (TYPICALLY 0.2m DIA. WITH PERFORATIONS AT 4 AND 8 O'CLOCK)
1.0 m APPROX.

PROFILE

N.T.S.

Notes

1. Improve slope stability by installing subdrains to divert shallow groundwater flow from the right-of-way. Clean gravel, wrapped in filter cloth, permits drainage and aids in retention of backfill. Note that this drawing depicts a cross-drain. In certain circumstances, the sub-drain may be installed lengthwise down the slope underneath the pipeline. A geotechnical engineer can advise on which method is most appropriate.
2. Determine the location of subdrain by on-site investigation considering such factors as groundwater conditions in trench, soil types, local topography, and drainage patterns.
3. Skew subdrain across the right-of-way 5° to ensure sufficient drainage.
4. Where drains cross pipeline trench, install trench breaker and diversion berm downslope of drain to prevent drain water flowing down pipe trench.

Source: Adapted from Marshall and Ruban (1983).

Figure 6.10 SUBDRAIN DETAIL

(Reference: Alberta Environment)

Section 7.0

TABLE OF CONTENTS

7.0 IN SITU HEAVY OIL FACILITIES

- 7.1 Application Procedures
- 7.2 Jurisdictions, Permits and Approvals
  - 7.2.1 Environmental Impact Assessments
  - 7.2.2 Development and Reclamation Approvals
- 7.3 Environmental Requirements
  - 7.3.1 Site Selection
  - 7.3.2 Waste Disposal
  - 7.3.3 Gaseous Emissions
  - 7.3.4 Water Supply
  - 7.3.5 Groundwater Aquifer Contamination
  - 7.3.6 Surface Water Contamination
  - 7.3.7 Wildlife
  - 7.3.8 Noise

LIST OF TABLES

Number	Title
7.1	In Situ Heavy Oil Facilities Environmental Concerns Directory

7.0 IN SITU HEAVY OIL FACILITIES

In general, in situ heavy oil projects are a combination of drilling, production and pipeline (collection) facilities. As a result, much of the information included in Sections 4,5 and 6 is also appropriate for this section.

The majority of regulatory approvals with environmental consequences are provided under the following Acts and Regulations (see Appendix A1).

1. Oil and Gas Conservation Act
2. Land Surface Conservation and Reclamation Act
3. Oil Sands Conservation Act and Regulations
4. Clean Air Act
5. Clean Water Act
6. Water Resources Act

The major issues regarding in situ heavy oil projects are as follows:

1. Under the Oil Sands Conservation Act, an ERCB application has to be prepared for all sites. The ERCB application includes an environmental component and a development and reclamation plan. The level of detail is dependent on the size of the project.
2. The public is very sensitive to in situ projects because of the level of activity. Public information programs are essential. If the proponent waits for an ERCB public hearing the costs are extremely high. The handbook User should refer to section 2.10 for a discussion on public involvement and hearings.
3. The high volume of wastes such as drilling muds, oily wastes and sands, and lime sludges is a concern.
4. Air quality is a concern particularly because of the annulus gas venting to the atmosphere. Also, there are wide variations in air monitoring requirements.
5. Produced water recycling is very important because of the large volumes of water required for the drilling and thermal processes.
6. Wildlife movement can be inhibited by collection pipeline systems that are located above ground.
7. The impact of an in situ project on surface and groundwater quality is a concern. Groundwater contamination is a potential problem due to the migration of pollutants, gases, and oils inside and outside the well casing. Also, the migration and percolation of waste leachates from waste containment ponds can cause groundwater contamination.
8. Surface disturbances and reclamation are of concern particularly in the agricultural areas.
9. Noise can be a public concern due to the high frequency of truck movement.

Table 7.1 is a quick reference which outlines environmental concerns, the location of information within this handbook and the regulatory agency contact for each environmental concern.

The ERCB has prepared a number of Interim Directives (ID) and Informational Letters (IL) regarding environmental concerns for in-situ projects. Relevant ID's and IL's are as follows:

ID-OG 75-2	Sump Fluid Disposal Requirements
ID 81-1	Subsurface Disposal of Drilling Fluids
IL 84-7	Declaration of Oil Sands Areas to Facilitate Orderly Leasing and Stable Regulation.
IL 85-12	Oil Sands Primary Production: Well Spacing Primary Recovery Scheme Approvals
IL 85-16	Storage Handling and Disposal of Oily Wastes.
IL 86-9	Approval Procedures for Single Well Steam Stimulation Test in Oil Sands Areas.

In addition, the ERCB has prepared a document entitled "The Lindbergh Oil Sands Area" (ENERFAX Factsheet No.5) which discusses the bitumen recovery process, insitu operations and environmental concerns pertinent to the Lindbergh Area.

TABLE 7.1

SECTION 7.0 - IN SITU HEAVY OIL FACILITIES ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Development and Reclamation (D & R) Plans	7.1, 8.4.1	• Alberta Environment (427-6323)
Environmental Impact Assessments	7.2.1	• Alberta Environment (427-6224)
Public Input	2.10	• ERCB (297-8121)
Water Resources - Surface and Ground Water	7.3.2, 7.3.4 7.3.5, 8.2, 8.7, 4.3.8, 5.3.10	• Alberta Environment - Ground Water (427-6241) • Surface Water (427-7054) (See Appendix C for regional offices) • Water Resources Branch Ground Water Protection Branch (427-6190)
Waste Disposal	7.3.2, 8.7, 8.6.3, 8.6.4	• Alberta Environment Waste Management Branch (427-5868)
Gaseous Emmissions	7.3.3	• Alberta Environment, Air Quality Control Branch (427-5893)
Water Reuse	7.3.4	• Alberta Environment, Standards and Approvals (427-5883)
Wildlife Movement	7.3.7	• Fish and Wildlife (See Appendix C for regional offices)
Noise	7.3.8, 8.8	• ERCB (297-8121)
Site Restoration	8.4	• Alberta Environment Reclamation Dividion (427-6323)
Access	8.1	• Municipal Jurisdictions • Alberta Transportation (See Appendix C for regional offices) • Property owner - if on Crown land, contact Forest or Public Lands Officer (See Appendix C for regional field offices of AFLW)

TABLE 7.1 (Continued)

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Clearing, Timber Salvage and Debris Disposal	6.3.2.4	• Forest Officers (See Appendix C for regional offices of AFLW)
Archaeological Survey	6.3.2.1	• Archaeological Survey of Alberta (431-2300)
Environmental Parameters	Appendix B	• Air photos (427-3519) • Maps (427-3520) • Soils Branch (427-5373 Alberta Agriculture)
Contingency Plans	8.9	• ERCB (297-8121) • Alberta Environment (427-6323)
Weed Control	8.11	• Alberta Environment Pesticides Branch (427-5855)
Abandonment and Decommissioning	8.10	• Alberta Environment (427-6323)
Camps	8.6	• See Appendix C for forest region or public land region field personnel

7.1 APPLICATION PROCEDURES

The handbook User should refer to two documents which will be available in 1988 from the ERCB (297-8121) or Alberta Environment (427-6323):

1. Oil Sands Guidelines - ERCB Application
2. Development and Reclamation Applications for In Situ Oil Sand Schemes.

All applications to the ERCB for oil sands recovery and upgrading require technical, economic and environmental information. An application for an oil sands scheme must include a brief summary of all aspects of the project, a statement of the general basis and objectives of the application, the types of approvals and permits that are requested and the relevant legislation under which application is being made.

The level of detail provided should suit the scope and complexity of the proposed scheme. Sufficient information should be available to permit the overall evaluation of whether the project will result in the economic and efficient use of resources and protection of the environment. The applicant should contact the ERCB and Alberta Environment to clarify the scope, content and level of detail required in support of its application.

In the interest of all concerned, applicants should plan and conduct a suitable program to make the public aware of the proposed development and, where feasible, to obtain and incorporate the reaction of interested or affected persons. Documentation of this program and its results is to be provided in the application to the ERCB. Without such a program, delays and other problems may arise during consideration of the application.

Applicants must realize that making an application to the ERCB does not eliminate the eventual requirement to obtain permit and licence applications required by other agencies and departments as discussed in chapters 4 to 6. Proponents must obtain approvals such as resource use approvals under the Forest Act, or The Water Resources Act, surface rights approval from private landowners or the Government under The Public Lands Act, planning approval under The Planning Act, and environmental approvals under the Clean Water Act, Clean Air Act and The Land Surface Conservation and Reclamation Act.

The type and level of environmental information required for the ERCB application is dependent upon the project. In any event, the environmental information must address the biophysical and social consequences of the development, and must provide a discussion of the available and proposed options to mitigate the effects.

In some instances the nature of the proposed scheme is such that an Environmental Impact Assessment (EIA) is required. Applicants should consult with Alberta Environment to determine whether their schemes require an EIA. Generally, EIA's are required for large, complex, commercial scale schemes having significant environmental effects. This decision is made on a case by case basis and applicants should not assume that an EIA is unnecessary.

In the environmental submission, the applicant must prepare a Conceptual Development and Reclamation Plan. The conceptual plan is the most recent plan, but it does not deal with details. The emphasis should be on land surface disturbance and land reclamation concepts (see Section 7.2.1, item 6).

It is necessary after the ERCB approval for the applicant to submit a Development and Reclamation (D & R) plan with the details (see Section 8.4.1.3). This detailed plan can be submitted with the original environmental submission and the EIA but the applicant is doing so at its own risk. If changes are necessary in the original application, the D & R plan will have to be re-submitted.

As defined by ERCB Informational Letter IL 85-12, there are certain primary production schemes such as conventional well target spacing that are exempt from a D & R approval.

7.2 JURISDICTIONS, PERMITS AND APPROVALS

As discussed in Section 7.1 there are three major steps for the environmental component of an in situ project application.

1. An environmental submission which could be an EIA submitted as part of the ERCB application.
2. A Development and Reclamation (D & R) Approval.
3. Other licences and approvals such as:
   a) resource use approvals under the Forest Act or Water Resources Act (see Appendix A1)
   b) surface rights (see Section 2.3)
   c) environmental approvals under the Clean Air and the Clean Water Acts.

7.2.1 ENVIRONMENTAL IMPACT ASSESSMENTS (EIA)

The major components of an EIA are listed below. The proponent must contact Alberta Environment (427-6202) to determine the level of detail required for the environmental submission.

1. Summary of oil sands scheme
   A brief discussion of the scheme and the environmental concerns and impacts.
2. Environmental alternatives
   A description of the major features of the scheme from an environmental perspective and the alternatives (e.g. siting, process selection, timing, etc.)
3. Biophysical assessment
   Undertake a biophysical assessment for the following:
      a) air resources and background noise
      b) water resources (surface and groundwater)
      c) topography, surficial geology and bedrock geology
      d) soils and overburden
      e) vegetation
      f) aquatic resources
      g) wildlife resources
      h) land capability

   The assessment should include the following:
      a) Describe the existing environmental conditions prior to development;
      b) Identify the possible effects of the development;
      c) Analyze the significance of these effects and identify those requiring specific attention;
      d) Identify the adverse environmental impacts that cannot be resolved through mitigation and analyze their implications.

4. Environmental Protection Plan

   The environmental protection plan is comprised of three parts: mitigation measures, environmental monitoring, and environmental research. This plan should address both biophysical and social impacts.
      a) Mitigation Measures

         (i) Provide a summary of all significant project impacts and mitigation measures, including parties responsible for the measures.

         (ii) Provide a summary of all major residual impacts (i.e. those that cannot be mitigated) and a discussion of their implications.

b) Environmental Monitoring

(i) Provide a description and illustration with appropriate maps, graphs, table and text of the objectives, methods and procedures of monitoring programs to be conducted by the applicant.

(ii) Provide a description of the programs to monitor the proposed mitigative measures.

c) Environmental Research

(i) Provide a description of any research programs needed to more fully assess certain impacts or to develop mitigative measures.

5. Conceptual Development and Reclamation Plan

This section must outline the most recent plan for development and reclamation of the entire scheme. Reference can be made, as appropriate, to information presented elsewhere in the ERCB application. The emphasis should be on discussing land surface disturbance and land reclamation concepts. Specific operational plans are dealt with in the detailed development and reclamation submitted, pursuant to the Land Surface Conservation and Reclamation Act, after the project has received ERCB approval (see Section 8.4.1.3).

As appropriate to the type of recovery method, the conceptual development and reclamation plan should provide the following information.

a) Overview of the development

A brief description and map illustrating the major components of the scheme and their areal extent, all activities resulting in surface disturbance, and a schedule outlining the duration of each activity is required.

b) Life-of-scheme development plan

This plan should include:

(i) a summary of the resource recovery plan

(ii) a general location plan on the infrastructure

(iii) a summary of the plan for developing the plant site

(iv) a conceptual plan on water management.

c) Life-of-scheme reclamation plan

This plan will include:

(i) a general reclamation plan focussing on land surface disturbance and land reclamation concepts

(ii) a discussion on long term management and maintenance requirements

(iii) a discussion on the post development site conditions including topography, soil characteristics, surface drainage and vegetation

(iv) an outline of any development and reclamation issues.

6. Waste Management Plan

This plan will include:

a) A description of wastes to be generated by the project, an indication if any of these wastes are hazardous and the type of treatment required

b) An indication of the methods of disposal to be used, including selection criteria and evaluation

c) An identification of the location of any proposed landfill, including site selection criteria and evaluation

d) A discussion, if drilling is to occur, of the type of fluid to be used, the rationale for selecting the fluid, and the disposal method to be used

e) A description, if incineration is used, of the location, type and size of incinerator. The air emissions resulting from the incineration shall be included in the section on air quality

   f) If road application of wastes is to be used, documentation to ensure the practice is acceptable to the local municipality and that the anticipated volume of wastes can be accommodated.

7. Social assessments

   The social assessment is intended to present the effects of the project on the population base. The assessment should cover the following topics:

   a) population
   b) employment
   c) special groups
   d) services and infrastructure
   e) land use
   f) economics
   g) housing
   h) quality of life
   i) historical resources

7.2.2 DEVELOPMENT AND RECLAMATION APPROVALS

As indicated previously, the Development and Reclamation (D & R) application can be made at the same time as the ERCB application or afterwards. For straightforward small projects it makes sense to apply for a D & R approval with the ERCB application. For larger projects it is quite possible a D & R application may have to be re-submitted as there will likely be changes in the ERCB application.

The details of a D & R application are provided in Section 8.4.1.3. All D & R application processes are in this Section.

7.3 ENVIRONMENTAL REQUIREMENTS

7.3.1 SITE SELECTION

Site selection is very important because of the extensive site disturbance caused by in situ projects. When considering site selection, the proponent should note the following areas of potential environmental concerns.

1. Clearing requirements (see Sections 8.4 and 4.3.2)
2. Soil conditions and salvage of soils
3. Drainage and erosion control (see Section 8.5)
4. Access requirements (see Section 8.1)
5. Public safety and health regarding air emissions (see Section 5.4.9)
6. Potential contamination of surface and subsurface water (see Sections 2.5, 7.3.5 and 8.7)
7. Location and distribution of pipeline network
8. Off-site energy and infrastucture requirements (e.g. roads)
9. Water management including source water, produced water and wastewater (see Sections 2.5, 8.7)
10. Potential land-use conflicts
11. Local archaeological and historical sites
12. Conservation and reclamation (see Sections 7.2 and 8.4)

7.3.2 WASTE DISPOSAL

The wastes generated from the heavy oil process include (see Sectons 5.3.7 and 8.7):

1. oil spill debris resulting from oil spill cleanup
2. solids eroded from the oil reservoirs and separated in the settling tanks
3. saltwater separated from the crude oil
4. wastes from production facilities and drilling operations
5. waste oil composed primarily of crude oil with suspended or emulsified inclusions of water and solids
6. waste sludge composed primarily of sand and silt with small quantities of crude oil and water generally found in the settling tank or from the desand pit or temporary storage pit
7. lime sludges from treating of either fresh water or produced water recycle, or both.

When dealing with these wastes, the handbook User should refer to two documents:

1. **Waste Disposal Guidelines for the Petroleum Industry**

   Information: Guidelines for the disposal of petroleum industry wastes.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

2. **Waste Disposal Guidelines**

   Information: Discusses the options for disposal of waste from heavy oil operations.

   Available: Sask-Alta Waste Disposal Cooperative, Husky Oil Operations Ltd.
   phone: (403) 825-1196.

The handbook User should also refer to the following sections of this handbook when dealing with the following wastes:

1. oil spill debris: Section 5.3.7
2. solids eroded from the oil reservoirs and separated in the settling tanks: Section 5.3.7
3. saltwater: Sections 8.7.7.6 and 4.3.5.2
4. wastes from production facilities and drilling operations: Section 4.3.5 and 5.3.7
5. waste oil: Section 5.3.7
6. waste sludge: Section 5.3.7.

As well, the handbook User should refer to the following ERCB Informational Letters and Interim Directives:

ID OG-75-2 Sump Fluids Disposal Requirements
ID 81-1 Subsurface Disposal of Drilling Fluids
IL 85-16. Storage, Handling and Disposal of Oily Wastes

7.3.3 GASEOUS EMISSIONS

Air emissions have been addressed in detail in Section 5.3.9. Annulus vent gases are a major concern in in situ heavy oil projects and are unique to this type of project. Annulus gases not only contain H_2S (e.g. after steaming) but also PNA's and sometimes chlorinated hydrocarbons. Annulus vent gases are a result of thermal recovery technology and with the high density of production wells, annulus gases become a concern. Alberta Environment requires the total elimination of H_2S release to the environment. This is accomplished through the flaring or incineration, or compression and collection of the annulus gases for use as a supplemental fuel. Compression and collection is common for commercial operations because it is cost efficient at that scale of plant.

Air monitoring requirements for in situ projects are site-specific. The hourly maximum ground level concentration for H_2S emissions is 10 parts per billion (ppb). Some point-source monitoring will likely be required such as:

1. once a week for the first 30 days
2. ambient air quality monitoring for varying periods up to six months
3. exposure station networks consisting of 4 to 12 stations for either H_2S, total sulphation or both

As indicated above, reporting requirements as defined by Alberta Environment are site-specific but air monitoring directives (see section 5.3.9) are being developed between the government and industry to standardize the monitoring requirements. Alberta Environment is also preparing standardized emisssion limits and monitoring requirements. The proponent should also refer to ERCB IL 86-9 for monitoring requirements applicable to single well sites.

7.3.4 WATER SUPPLY

In situ heavy oil projects require substantial amounts of water. The major concern is the overuse of surface water and aquifers (e.g. water yield, water recharge rates and water quality). Water supply from surface or groundwater requires approval under the Water Resources Act.

Due to the fact that aquifers are limited, surface water supplies are often utilized. If a surface water supply is utilized, it is important that a water balance is undertaken on the hydrology of the surface water system (e.g. water flowing into surface water body versus water being removed). The water balance will show the impact of removing water from the surface water source (e.g. lake depth changes).

Treatment of surface water can be more maintenance intensive than treatment of groundwater. A surface water intake system will be necessary and thus can be costly.

As a result of the concerns with water supply, there is a strong movement towards mandatory water recycling.

For further details on the regulatory requirements for water supply, see Section 5.3.10 (Waterfloods).

7.3.5 GROUNDWATER AQUIFER CONTAMINATION

There is a major concern regarding the impact of in situ heavy oil projects on groundwater aquifers used by local residents for drinking (potable) water. This concern is certainly prevalent at public hearings on in situ heavy oil projects.

The possible situations in which a groundwater aquifer could be contaminated are as follows:

1. Associated with wells drilled in areas of heavy oil production, gas has been identified as migrating to the surface and several local landowners have identified gas venting in freshwater supply systems. The source of the gas and method of migration is unconfirmed and methods to avoid or mitigate the problem have not been demonstrated.
2. Surficial spills of saltwater, hydrocarbons, chemicals, oily sludges and wastes, leaks from desand pits, holding ponds or landfill sites, and spills from trucks and flowlines. These spills could migrate downward to impact a groundwater aquifer.
3. During drilling of the production, steam injection and wastewater wells, various mud types are used to lubricate the bit, enhance borehole stability, remove cuttings and control formation pressures. The freshwater aquifers are subject to contamination due to mud filtrate losses. While more significant contamination may occur as a result of lost circulation, the risk of this occurring is low.
4. Depending upon the quality of steam injected, steam may be a concern if it migrates around or through the casing and into the porous sands of the freshwater aquifer.
5. Chemicals and acids used to complete and workover production wells and their interaction with the freshwater aquifer have elicited concern from local landowners.

6. Depending upon the process, stage of development and water recycling program, two to five barrels of wastewater can be produced for each barrel of heavy crude. This wastewater, which is mainly produced water with small quantities of chemical additives, is injected into deep formations below the producing formation and above the PreCambrian basement. The migration of these fluids once injected into the disposal formation is not documented. As a consequence, concerns have been raised with respect to the formation selected, quality of water injected, integrity of the well completion design and migration of the fluids along the borehole, fracturing of the disposal formation and overlying cap rock and migration of the fluid within the formation.
7. The location of wells could result in an interconnection between aquifers. One aquifer may contaminate another aquifer.

To ensure groundwater contamination is not a problem, the following recommendations should be adhered to:

1. Well casings must be carefully specified and highly controlled during installation (see Section 4.3.8).
2. Spill prevention and containment facilities must be continually monitored and inspected (see Sections 4.3.3, 5.3.3 and 5.3.6).
3. Groundwater monitoring programs should be designed and implemented to detect any leakage that may be occurring. Alberta Environment does not have standardized requirements in this area but will require a groundwater monitoring program specifically designed for each project. The monitoring program will be outlined on the Clean Water Licence. This program will be developed based on the density of local residents and their use of groundwater, the spill containment systems in place, the waste disposal requirements, and the existing water quality of the groundwater aquifer. The handbook user should contact Alberta Environment, Standards and Approvals Division, phone: (403) 427-5883 regarding groundwater monitoring requirements.

7.3.6 SURFACE WATER CONTAMINATION

The proponent should refer to Sections 5.3.3 and 8.7.7.3.

7.3.7 WILDLIFE

The concern with the impact of in situ heavy oil projects on wildlife centres around the effect of above-ground pipelines on the movement of ungulates. With in situ heavy oil projects, collection/flowline pipelines can be very dense between wells and production facilities. It is not unusual to have a 300 mm diameter pipeline plus insulation mounted three together on pilings at ground level or 1 to 2 metres above-ground. The pipe networks should be kept at ground level or have locations along the pipeline network that accommodate wildlife crossings where the manifold dips to ground level to allow the ungulates to cross over.

7.3.8 NOISE

Another major concern addressed at public hearings is the noise impact at in situ heavy oil projects. The noise is generated from the intensive drilling operations and the extensive trucking. The handbook User should refer to section 8.8 for noise guidelines.

Section 8.0

TABLE OF CONTENTS

8.0 DEVELOPMENTAL/OPERATIONAL ACTIVITIES

- 8.1 Access Roads
  - 8.1.1 Integrated Uses of Access Roads
  - 8.1.2 Route Selection
  - 8.1.3 Environmental Guidelines
- 8.2 Stream Crossings
  - 8.2.1 General Environmental Guidelines Applicable to all Stream Crossings
  - 8.2.2 Specific Environmental Guidelines for Particular Stream Crossings
- 8.3 Surface Materials
  - 8.3.1 Public Lands
  - 8.3.2 Quarriable Minerals on Public Lands
  - 8.3.3 Surface Material on Patented Land
  - 8.3.4 Quarries on Patented Land
- 8.4 Reclamation and Conservation
  - 8.4.1 Reclamation Plans for Regulated Operations
  - 8.4.2 Reclamation in Forested and Non-Forested Areas
  - 8.4.3 Spills and Cleanup
  - 8.4.4 Revegetation
- 8.5 Erosion
  - 8.5.1 Types and Effects of Erosion
  - 8.5.2 Guidelines for Erosion Control and Restoration of Eroded Areas
- 8.6 Camps and Camp Operations
  - 8.6.1 Camp Location and Camp Rules
  - 8.6.2 Potable Water
  - 8.6.3 Sewage Effluent and Wastewater Treatment
  - 8.6.4 Solid Waste Disposal
  - 8.6.5 Fuel Handling and Storage Facilities
  - 8.6.6 Restoration of Landscape Affected by Camp Facilities and Activities
- 8.7 Waste Handling
  - 8.7.1 Drilling Wastes
  - 8.7.2 Production Wastes
  - 8.7.3 Miscellaneous Wastes
  - 8.7.4 Transportation of Dangerous Goods
  - 8.7.5 General Solid Wastes
  - 8.7.6 Sanitary Wastes
  - 8.7.7 Waste Management Systems
- 8.8 Noise
- 8.9 Emergency Procedures and Contingency Plans
  - 8.9.1 Well Drilling, Completion or Testing of Sour Gas Wells
  - 8.9.2 Sour Gas Facilities
  - 8.9.3 Spill Response and Contingency Plans

8.10 Abandonment and Decommissioning
    8.10.1 Reclamation Orders and Certificates
    8.10.2 Abandonment
    8.10.3 Decommissioning
8.11 Pesticides, Herbicides and Chemical Handling
    8.11.1 Application of Pesticides
    8.11.2 Chemical Handling
8.12 Environmental Audit
8.13 Public Participation

LIST OF TABLES

Number	Title
8.1.1	Access Roads Environmental Concerns Directory
8.1.2	Integrated Road Classification
8.1.3	Route Selection Phases
8.1.4	Cut Slope and Fill Slope Angles for Different Soil Materials
8.2.1	Stream Crossings Environmental Concerns Directory
8.2.2	Watercourse Vehicle Crossing Methods
8.2.3	Timing Concerns for Various Species of Alberta Fishes
8.3.1	Surface Materials Environmental Concerns Directory
8.4.1	Reclamation and Conservation Environmental Concerns Directory
8.4.2	Development and Reclamation Application for Experimental In Situ Oil Sands Scheme
8.5.1	Erosion Environmental Concerns Directory
8.5.2	Guide for Assessing Soil Erosion Hazard
8.5.3	Interval for Openings in Berms and Cross Trenches
8.5.4	Back-slope and Fill-slope Angles for Different Soil Materials
8.6.1	Camps and Camp Operations Environmental Concerns Directory
8.7.1	Waste Handling Environmental Concerns Directory
8.7.2	1982 Environment Canada PCB Inventory
8.7.3	Standards of Treated Surface Runoff Water
8.9.1	Emergency Procedures and Contingency Plans Environmental Concerns Directory
8.10.1	Abandonment and Decommissioning Environmental Concerns Directory
8.11.1	Pesticides, Herbicides and Chemical Handling Environmental Concerns Directory

LIST OF FIGURES

Number	Title
8.1.1	Dog-Legged Stream Crossing Approach
8.1.2	Inadequate Drainage
8.1.3	Outsloping of a Road for Proper Drainage
8.1.4	Detail of Road and Brush Plan Cross-section
8.1.5	Berms Used for Drainage Structures
8.1.6	Eroded Gully
8.1.7	Brush Encroached Upon Roadway
8.2.1	Temporary Bridge
8.2.2	Ice Bridge
8.2.3	Tvpical Ford Location
8.2.4	Log Fill Installation
8.2.5	Corduroy Roads
8.2.6	Culvert
8.2.7	Arch Culvert
8.2.8	Horizontical Elliptical Culvert
8.2.9	Fish Obstruction
8.2.10	Restoration of Habitat
8.3.1	Surface Materials on Patent Lands - Application Procedure
8.3.2	General Plan and Cross-Section of Excavation Area
8.3.3	Buffer of Windfirm Trees Left Between Borrow Pit and Right-of Way for Roads.
8.4.1	Division of Relaxed and Partial Disposal Areas
8.5.1	Placement of Rip-rap
8.5.2	Culvert to Divert Silt Laden Waters
8.5.3	Cross Ditching, Berm and Slope Obstructions
8.5.4	Step Slopes
8.5.5	Berms at Top of Embankment
8.5.6	Slope Drains
8.5.7	Fill Berms and Benches
8.6.1	A Well Laid Out Camp-Site
8.6.2	Septic Tank and Leaching Pit
8.6.3	Black Water Vacuum System-Schematic
8.6.4	Area Fill Method
8.6.5	Trench Method
8.7.1	A Typical Injection Well

8.0 DEVELOPMENTAL/OPERATIONAL ACTIVITIES

Relevant ERCB Interim Directives (ID) and Informational Letters (IL) for this section are as follows:

ID 75-2	Sump Fluid Disposal Requirements
ID 80-2	Noise Control Guidelines
ID 81-1	Subsurface Disposal of Drilling Fluids
ID 85-4	Zama Lake Area: Special Requirements Regarding Waterfowl Migration
ID 87-2	Sour Well Licensing and Drilling Requirements
IL 80-24	Sulphur Recovery Guidelines - Gas Processing Operations
IL 81-10	Disposal of Campsite and Well Site Waste
IL 83-10	Disposal of Oil Field Waste
IL 84-11	Approval, Monitoring, and Control of Sulphur Storage Sites
IL 85-16	Storage, Handling, and Disposal of Oily Wastes

8.1 ACCESS ROADS

Access roads are constructed by the industry to support various resource developments. Access roads on public lands are subject to approval by AFLW. A licence of occupation (LOC) is required if the road is 400m ($^{1}/_{4}$ mile) in length or more. If the road is less than this length, the road surface rights could be issued under a Mineral Surface Lease (MSL) if surface rights for both the road and the well site are being applied for at the same time. A flow diagram of the application procedure is shown in Figure 2.7 in Section 2 of this handbook.

Basically, two types of access roads are recognized:

1. permanent (e.g. gravel haul roads, roads to well sites and those used for 2 years and more)
2. temporary (e.g. winter snow roads, minimum well site access and those used for 2 years or less).

The access roads are usually connected to the existing road systems. (See Appendix B, Section B.5 "Existing Infrastructure and Related Facilities," for more information).

For construction of all access roads on Public lands, a permit is required from AFLW (e.g. LOC - for example of permits, see Appendix D - Permits, Licences and Approvals). For construction of access roads on private lands, permission is required from the owner. If the access road is going to cross a numbered highway or local road, permission is required from the District Engineer of Alberta Transportation. (See Appendix C for contact address and phone numbers.) For access roads to be built on lands under the jurisdiction of municipalities, permission is required from each municipality.

Legislation that regulates the development of access roads for industry includes:

1. The Forests Act
2. The Forest and Prairie Protection Regulations, Part II
3. The Public Lands Act
4. The Land Surface Conservation and Reclamation Act.

Descriptions of the above Acts and Regulations are available in Appendix A1.

To undertake the appropriate access road design, the handbook User should obtain a copy of the document entitled "Resource Road Planning Guidelines" available from AFLW, phone (403) 427-3590.

Table 8.1.1 is a quick reference which outlines environmental concerns, the location of information within this handbook, and the regulatory contact for each environmental concern.

8.1.1 INTEGRATED USES OF ACCESS ROADS

One of the major concerns in the development of access roads is the evaluation of the present and long-term potential of the access road. Design and alignment should take into account the long-term use of the road.

TABLE 8.1.1

SECTION 8.1 - ACCESS ROADS
ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Right-of-Way Selection	8.1.1, 8.1.2, 8.1.3.1, 6.3.1	● Property owner – if on Crown land, contact Forest or Public Lands Officer (see Appendix C for regional offices of AFLW)
Surface Rights	8.1.1, 8.1.3.1 Table 2.1, Table 2.3	● Same as above
Stream Crossings	8.2	● Same as above ● Fish and Wildlife (see Appendix C for regional offices) ● Alberta Environment, Water Resources Branch (see Appendix C for regional offices)
Sand, Gravel and Borrow Pit Operations	8.3, 8.4.1,	● On patented land, contact Alberta Environment (427-6325) ● On Crown land contact Forestry or Public Lands regional offices (see Appendix C)
Reclamation and Restoration	8.4	● Same as above
Erosion Control	8.5	● Same as above
Weed and Vegetation Control	8.11	● Alberta Environment Pesticides Branch (427-5855)

An integrated road classification system has been developed, as indicated in the document entitled "Resource Road Planning Guidelines." The integrated road classification is composed of five classes of roads for use by the petroleum industry, timber industry, government, and for recreational access in the Green Area. These roads are either permanent (2 years or more) or temporary (less than two years). Table 8.1.2 describes each class of road for each of these resource users. The table also illustrates how a class of road in one category relates to the same class of road in the other categories. This relationship can assist the planner in the design of a road to suitably accommodate other potential uses and users if the need is indicated. Although this classification pertains to these resource users in the Green Area, it can be adapted to accommodate other uses such as coal exploration and development.

This classification will apply to the planning, design and construction of any new roads and any upgrading of existing roads and road systems.

Roads that have originally been built for one purpose are very often later used and upgraded for another purpose. Road rights-of-way often become a focus for other linear facilities. It is important that, in selecting a road class and in locating a road (especially key development roads), other uses and users be considered.

Road rights-of-way are often utilized to locate other facilities such as powerlines, pipelines and telemetry cables. These rights-of-way usually require additional clearing to accommodate these facilities, and more often new rights-of-way are used. The linear aspect of these facilities is important in the design and location of the road. A road with many curves would not be as suitable for locating a pipeline as a road with long tangents and few curves. A road to an exploratory drilling site often becomes the focal location for advanced road development required by development drilling. The initial right-of-way (location and design) becomes very significant if the total infrastructure that may later develop is considered.

Road Use Agreements are agreements signed between the holder of the Licence of Occupation (LOC) for the road and another industrial user. This occurs most often between the timber industry and petroleum industry or among petroleum users. Problems with other road developments are often associated with these agreements, especially between the timber industry and petroleum industry. Load and hauling requirements are often different for these users. For example, a road built by the petroleum industry is often not of the standards required by the timber industry. This particularly pertains to the grade and subgrade portion of the road. If a petroleum user constructs a road in an area where the timber industry is responsible (i.e. an FMA Area) the future use or potential use of that road by the timber industry (in accordance to their annual and long-term operating plans) should be considered. The minimum joint effort should at least have an alignment selected that will satisfy both users now and in the future.

Except at controlled gates or at controlled access points, the general public has access to all roads. The major industrial roads receive more use by the public than other industrial roads, primarily for recreation. The potential for a recreational use should be considered during the planning stages. Key considerations are road location, design, aesthetics and safety.

Table 8.1.2

INTEGRATED ROAD CLASSIFICATION

Road Class	Timber	Petroleum	Forest
I	Permanent, year-round access to a working area. 20 years +.		
II	Permanent, year-round access. A branch road serving as a collector or as main winter haul road. 10 years +.	Permanent, year-round access to petroleum fields and/or processing facilities. 10 years +.	Permanent, year-round access to recreation areas. 10 years +.
III	Permanent, access available during dry or frozen periods to cut blocks. 2 to 20 years.	Permanent, year-round access. A collecting system for petroleum facilities. 10 years +.	Permanent, year-round or seasonal access to recreation areas. 10 years +.
IV	Temporary, access during dry or frozen periods between and within cut blocks. 2 - 5 years or term of operations.	Permanent, year-round access to petroleum facilities such as wellheads. 10 years +.	Permanent, year-round or seasonal access for fire control towers, AFS gravel pits and recreation. 10 years +.
V	Temporary, access during frozen periods between and within cut blocks. 2 years or less.	Temporary, access during dry or frozen periods for exploration drilling. 2 years or less.	Temporary, seasonal access for reforestation and reclamation programs and other resource uses. 2 years or less.

Note : Descriptions are based on the needs of resource users in the Green Area of Alberta. All classes may or may not be used depending on geographical location or by the need for the use of only some classes of roads. These classes of roads should permit integrated resource use. For example, a class IV timber road by itself is temporary; however, the planning process may indicate the future need for a recreational road or for development drilling in the area. This road, then, should be developed to accommodate those needs or have an alignment that will satisfy these users.

Source: Resource Road Planning Guidelines, AFLW.

8.1.2 ROUTE SELECTION

If a new road is required there will be a need for a route selection study. The route selection process consists of two distinct phases:

1. Regional Study
2. Detailed Route Selection

The objectives of these two phases are outlined in Table 8.1.3.

Table 8.1.3

ROUTE SELECTION PHASES

Phase 1 - Regional Study	Phase 2 - Detailed Route Selection
Objective: To locate, assess, and compare regional study corridor(s). 1. Identify study area's size and shape. 2. Compile and analyze biophysical data (existing in many cases as published, small-scale maps and records).† 3. Identify alternative corridors. 4. Identify impacts along corridors. (Reconnaissance site investigations are required for such things as potential river crossings.) 5. Measure impacts. 6. Rank corridors according to environmental impacts.	Objective: To locate, assess, and compare routes within preferred corridor(s). 1. Determine study area by corridor boundaries. 2. Conduct detailed biophysical data inventory and analysis within preferred corridor(s). (Site investigations.) 3. Identify routes and route alternatives within preferred corridor(s). 4. Identify impacts of the chosen route(s). 5. Measure impacts of the chosen route(s). 6. Rank routes by least environmental impact.

Note: Successful selection of a route is followed by detailed design and construction.

†Engineering and socioeconomic data are analyzed concurrently.

Source: Resource Road Planning Guidelines, AFLW.

8.1.3 ENVIRONMENTAL GUIDELINES

8.1.3.1 Permanent Roads

The following guidelines should be noted:

1. Right-of-Way Selection and Design
   a) Right-of-way selection is a multi-disciplinary process. Each area within a route will have its own unique terrain, and supports distinct flora and fauna. All available data on the environmental, geotechnical and hydrological aspects should be assessed in selection of the road right-of-way (Curran 1976).

      During the selection of a right-of-way, the following should be accomplished:

      (i) A consensus should be reached on the long-term function and required standards for the proposed access road.
      (ii) The type and location of materials for construction of the road should be identified.
      (iii) Environmentally critical areas which prohibit road development should be identified and routes that avoid them selected.
      (iv) Possible alternative alignments connecting terminal points in a given route should be selected.

b) Information available for preliminary route selection is as follows:

   (i) 1:50000 topographic maps to delineate the routes.

   (ii) Aerial photographs to prepare detailed contour maps for major river crossings (Scale 1:4800 and 3m contour intervals).

   (iii) Alberta Soil Survey Maps to indicate surface soil types along the proposed routes. A rating of erodibility and suitability for road construction has been prepared for each soil type by the Alberta Soil Survey. The Alberta Soil Survey maps are available from Alberta Research Council.

   (iv) Alberta Forest Service Cover Type Maps to determine the existing vegetation types. Vegetation type is usually an indicator of soil moisture conditons.

   (v) Information on environmental sensitivity in the eastern slopes (Canada and Alberta Land Inventory Maps).

   (vi) Key area maps (1:50000) for fish and wildlife (See Appendix B "Maps and Directories for Environmental Concerns" for further information.).

c) Consultation should be made with adjacent communities and the Land Use Section of Alberta Forestry, Lands and Wildlife to determine the long-term use of the road (PITS, 1979).

d) To minimize the need for deep cuts and the possible occurrence of slumping of sides, the designer should avoid steep gradients. A maximum slope of 7% is recommended for all roads (Diand, 1975).

e) To minimize disturbance to watercourses, no part of the road should pass within 100m of the high-water mark. Roads should not parallel the stream before crossing unless no other alternative exists (Curran, 1976).

f) A buffer zone of 450m should be maintained between the road and designated critical wildlife habitat, potential or established recreation area, or the boundary of an ecological reserve (AFS, 1984).

g) At a stream approach, not more than one crossing can be made at the intersection of the access road and the stream. The preferred method uses a "dog-legged" approach (see Figure 8.1.1) (AFS, 1984). Road alignment must not constrict the stream channel.

h) Clearing widths should be kept to a minimum and tailored to construction and safety requirements. Clearing operations which extend beyond normal earthwork procedures for grade and ditching should be limited to brushing and stumping. The limits for clearing widths are defined in the "Resource Road Planning Guidelines", however justifications may be required if these limits are to be exceeded. This may include requirements for increases in sight distance, topographical constraints or increased exposure of road surface for drying. Tree height should be considered in evaluating right-of-way requirements. Excessive clearing should be avoided to reduce the total amount of land base taken out of production.

i) Traditionally, rights-of-way were cleared with linear edges according to the right-of-way edge survey lines. To be environmentally acceptable, however, this should be modified to provide a curvilinear edge on either side of the right-of-way.

   Variable width clearing of the right-of-way can appear as natural features. This can be accomplished through proper reclamation on borrow pits located on the right-of-way, by selective cutting of trees susceptible to blowdown, by selective cutting to enhance scenic view, through additional land requirements for slopes and timber decking or as part of the road design. Variable width may be appropriate in some areas but not in others.

j) The angle of cut and fill slopes is dependent on soil type, soil stability and water bearing capacity. The majority of erosion on roads is attributed to these slopes. Locating roads on ridges and moderate slopes, fitting the alignment to topography, providing adequate drainage and stabilizing slopes decreases surface disturbance and reduces erosion. The amount of soil erosion expected increases as slope increases. Some land surfaces are subject to slumping. Aerial photo interpretation, field inspections and lab analysis of soil samples can be used to assess soil erosion hazard and slope stability. Steep road cuts may be used if the total area of soil to be exposed to erosion can be reduced (see Table 8.1.4), provided that the shear strength of the soil is not exceeded. Exposed slopes greater than 2:1 are more likely to have erosion problems.

Table 8.1.4

CUT SLOPE AND FILL SLOPE ANGLES FOR DIFFERENT SOIL MATERIALS

Cut Slopes		Fill Slopes	
Flat ground cuts under 0.9 m	2:1	Common for most soil	1:1
Most soil types with ground slopes under 55%	1:1	Alluvial soils	2:1
Most soil types with ground slopes over 55%	3/4:1	Ballast	1:1
Hardpan or soft rock	1/2:1	Clay	4-1:1
Solid rock	1/4:1	Rock, crushed	1-1/4:1
		Gravel	1:1
		Sand, moist	1 1/2-1:1
		Sand, saturated	2:1
		Shale	1 1/2:1

k) Slash and debris should be spread over the cut slope and fill slope areas as it can be used to control soil erosion and facilitate revegetation. The degree to which this is used is dependent upon other considerations such as fire hazards, type of road and time since it was developed (see Section 8.4).

l) The road surface width should be adequate to allow safe passage of vehicles. The class of road dictates these requirements, with more emphasis on higher class roads which will have more vehicle traffic than lower class roads. The crown of the road should outslope to ditches to allow for drying and drainage of the road surface. Site-specific situations may require berms on the road surface edge to transport water to prepared ditches. Permanent roads will require a gravel surface. Temporary roads for winter use only generally do not require a road base; however, site-specific situations may require fill in soft spots. Roads located on the south aspect of slopes will dry sooner than roads located on the north aspect.

m) During grade preparation, topsoil, strippings, slash and debris may be salvaged and stored at approved sites. When grade is complete, the topsoil can then be respread on exposed cuts and fills, and other exposed areas to facilitate a quick return of vegetation after revegetation procedures are complete.

n) Grade preparation in muskeg areas is critical for road stability and drainage. Extreme care must be taken to prevent crust breakage of the muskeg surface. Breakage of the crust often results in road failure, erosion and severe drainage problems. Geotextile felt products and porous polypropylene materials offer a wide variety of solutions in muskeg areas and other poor soil and drainage areas. The basic function of these materials is to act as a reinforcing and separation membrane between the subgrade and aggregate fill. It increases the load bearing capacity, prevents mixing of subgrade and fill, and allows for passage of water.

o) A drainage system is a system to intercept, collect and remove surface and subsurface runoff from roads. If a drainage system is inadequately blocked or underdesigned, excess water can erode surfaces, weaken grades, cause slumping and washouts, and result in higher maintenance costs.

Control measures for erosion are numerous and often are site-specific; however, with any type of drainage system used, rip-rap, ditch blocks, gabions, and revegetation of exposed areas should always be employed initially as a preventative measure rather than a solution to a recurring problem (see Section 8.5). Spreading debris on exposed surfaces also reduces erosion and encourages vegetation.

At all times, proper drainage must be incorporated into road construction to minimize erosion on the road surface, the cut and fill slopes or the ditches. In order to achieve this, the following are required in many instances:

(i) Roads should be well ditched and provided with adequate culverts of proper size and alignment to handle peak runoffs, and to minimize water movement along ditches and road surface.

(ii) No ditch should drain directly into a watercourse unless limited by topography and approved in writing by a Forest Officer in consultation with the Fish and Wildlife Habitat Biologist. Ditch blocks are to be installed where required.

(iii) All drainage water should be diverted, if possible, so that it does not pass over fills or collect in cuts, borrow areas, or waste dumps.

(iv) Adequate spillways should be provided if culverts outfall on unstable areas or road fill materials.

(v) Sediment catch basins should be provided at the entrance to major culverts if deemed necessary by the Forest Officer.

(vi) Special erosion control measures may be required on cuts or fills greater than 6m (20 feet) to reduce bank erosion, including measures such as contour trenches or terracing.

(vii) Culverts should be rip-rapped, as necessary, to prevent erosion at both inflow and outflow ends.

(viii) Culverts or other drainage devices should be placed at an angle to the road so as to attain maximum drainage efficiency.

(ix) Buffer strips should be left where roads on steep slopes are close to important streams. Where vegetation strips are employed for water filtration and do not effectively retard sediment movement, a system of obstruction (i.e., logs, rocks and mounds) shall be placed between the drainage outlet and watercourse.

(x) "V" ditches should be rock-lined where site-specific situations such as grades and slopes dictate this requirement to minimize erosion and gullying. On scraper or rounded ditches, rock lining may also be required in some situations to minimize erosion and gullying.

(xi) Cross drains may be required where grades and soil conditions permit. Cross drains should be placed to divert water off the right-of-way into surrounding vegetation in as short a distance as possible. Where conditions do not permit cross drains, other measures such as ditch blocks should be used.

(xii) Where the outflow ends of culverts are located near the top of fill slopes, downspouts should be installed to transport water down the slope into prepared ditches. Temporary measures such as the use of plastic can be employed during construction stages.

For further information and detail on erosion control measures, the handbook User should refer to Section 8.5.

2. Environmental Survey of the Proposed Route

Proposed routes should be studied to obtain the environmental base-line data needed for final route selection and preliminary design. The following guidelines should be considered:

a) A terrain sensitivity study should verify assumptions (based on air-photo interpretations) made in the preliminary route selection. This study should also investigate route alternatives that would avoid sensitive and critical ecological areas, identify historic sites or take advantage of scenic views along the route. Shallow excavations should be made to visually classify surficial soils. In areas of permafrost, the thickness of the active layer should be determined. Estimates should be made of the apparent stability of natural slopes or stream banks.

b) The fisheries potential should be estimated based on fish type, abundance and distribution in streams which could be crossed or approached by the road. Fishery protection measures appropriate to each stream should be stipulated for fish passage, stream bed protection, siltation control and scheduling of construction (see Stream Crossings, Section 8.2).

c) Wildlife investigations should determine factors such as prime ungulate habitats and wintering ranges, waterfowl nesting and staging areas, location of rare or endangered species, and distribution of economically important fur-bearing animals such as muskrat and beaver. These investigations should provide the basis for identifying the location and extent of critical wildlife areas.

d) Centreline profiles and sideslopes should be determined by the field survey.

e) Ground reconnaissance should evaluate:

  (i) Landscape for features of scenic value. Taking advantage of the natural scenic qualities of the landscape usually incurs additional costs. In deciding what expenses are justified, the function of the road, and immediate and long-term uses should be considered

  (ii) Erosion potential for erosion control guidelines (see Section 8.5).

  (iii) Drainage requirements and determine the locations of cross-drainage culverts (see Section 8.5).

  (iv) Critical or sensitive wildlife habitat areas (see Appendix B.3.6).

f) A Geological survey should be carried out along the final alignment. This survey should determine:

  (i) availability of construction materials,

  (ii) possible areas of terrain instability,

  (iii) slope stability on steep grade,

  (iv) proposed excavations and cuts,

  (v) erosion potential along the selected route and possible mitigative measures,

  (vi) in situ soil characteristics with the use of drill holes (e.g. soil density, type, grain size, drainage potential, stability characteristics). Drill holes are normally drilled to a maximum depth of 4.6 to 6.0m at maximum spacing of 300m.

g) A hydrological survey should be carried out to obtain a profile of both riverbed and water surface elevations 50m upstream and downstream from each proposed major watercourse crossing. Three complete cross-sections of the hydrologic regime should be produced; upstream, downstream and at the proposed crossing. Hydrological stream profiles are available for major rivers from Alberta Research Council, Highways Division. Observations should be made of the debris carried in the river, especially during spring flooding.

h) All survey operations should be carried out with as little environmental disturbance as possible.

3. Construction Guidelines.

For construction, the following guidelines should be noted:

a) Clearing, Timber and Debris Disposal:

Clearing of the right-of-way should be kept to a minimum. The right-of-way should be cleared only for road embankment and drainage requirements, and to allow safe passing and stopping sight distances.

(i) The Forest and Prairie Protection Regulations, Part II and the Timber Management Regulations stipulate the requirements for cutting, clearing and timber disposal for exploration lines and access routes. These activities should employ methods which will result in the least environmental damage and forest growth removal.

(ii) Debris and slash must be disposed of to reduce fire hazard, avoid compromising future uses of the site, maintain aesthetic quality and aid in revegetation and reclamation.

(iii) For regulations and guidelines on debris clearing, timber salvage and disposal refer to "The Resource Handbook" (AFS, 1984).

b) Drainage:

Access roads cannot avoid altering natural drainage patterns. Changes in natural conditions should be minimized while attaining maximum erosion control. The consequences of inadequate drainage are extensive and include ponding, flooding, washouts, and inundation of vegetation resulting in increased road maintenance. Flooding or draining marshes can result in reduction of wetland habitat (see Figure 8.1.2).

(i) Proper drainage of the road surface can be achieved simply by outsloping, so that the road surface slopes downward across the road from the toe of the road cut to the road shoulder (see Figure 8.1.3). All outsloped roads should have diversion culverts to prevent accumulation of runoff water. Outsloping is preferable for use on contour roads only. Proper drainage on grade and fill roads is accomplished by maintaining proper grade. For typical cross-sections see Figure 8.1.4.

(ii) Drainage structures such as berms should be of sufficient size to accommodate maximum yearly runoff flows. For typical berm specifications, see Figure 8.1.5.

4. Maintenance Guidelines

Before the construction of an access road on public land, the proponent must apply for a "Licence of Occupation" which gives the company responsibility for road maintenance and control of other industrial users while allowing public access. The following guidelines should be noted (AFS, 1984):

a) Prior to commencement of the maintenance program, maintenance personnel should be briefed on:

(i) Difficult areas of construction where maintenance problems may arise.

(ii) Sensitive wildlife or aquatic habitat locations and the reasons for their sensitivity.

(iii) The appropriate erosion control structures and their location.

(iv) Seed and fertilizer mixtures and their application as a follow-up to initial establishment of vegetative cover (see Section 8.4).

(v) Herbicide restrictions.

b) All roads should be maintained to allow proper drainage and to prevent erosion (see Section 8.5). This includes annual clean-out of ditches, culverts and erosion control structures.

c) All bared surfaces, with the exception of roads, should be revegetated within one full growing season to minimize erosion. In addition to seeding, the area may require fertilizer and mulch. Steep slopes may require stabilization by contour trenching or other methods in addition to seeding (see Section 8.4).

d) Road grading is the principal maintenance operation. In reworking the gravel, the operator should be careful not to blade it onto the shoulders of the road. Ridges should not be left on the edges of the roadway because they act as berms which retain runoff water at the bottom of depressions. The resulting erosion can be severe and could cause stability problems (see Figure 8.1.6).

e) Dust control with the use of oil or chemicals should be undertaken carefully. Spillages must be avoided, especially near watercourses. If they occur, cleanup must be immediate (for methods see Section 6.4.7). Oils containing contaminants such as phosphates or nitrates should **not** be used for dust control. The use of oil for dust control could present a potential hazard to roadside vegetation and water pollution. Because of the dust problem, picnic and camping areas should be located a minimum of 60m from the right-of-way. The proponent must contact the proper authorities for approval (ERCB, AFLW, Municipality, Alberta Environment, see Section 5.3.7).

f) Every operation should have a contingency plan which will ensure prompt and efficient remedial action should an accident occur. Oil spills, sump failures, forest fires, and well blowouts are the most likely accidents. Road maintenance equipment must be kept available at all times to ensure that these contingency plans can be implemented when required. (Environment Canada, 1977).

g) Borrow and gravel pits opened during construction should be used for repair material. Stockpiles of material should be built up in the summer for ready use in the spring. For more information on borrow and gravel pits, see Section 8.3.

h) The right-of-way must be kept clear of tall growing bushes and trees to maintain safe stopping and passing sight distance (see Figure 8.1.7). Bulldozers should not be used for clearing because of the damage they do to the terrain. Light equipment with rotary mowers or sickle bars should be used instead.

i) Snow banks on roads should not be any greater than 1m high and preferrably not higher than 0.5m. If banks must be higher, gaps should be placed to provide wildlife passage.

8.1.3.2 Temporary Access Roads

A temporary access road is any roadway which is used on a temporary basis and usually lacks any preset grades. The rights-of-way for temporary access roads are a maximum 20m wide. Temporary access roads have an absolute minimum number of cuts and fills and may require tow-cat travel of large vehicles on some portions of the road.

Temporary access roads on Public lands must be approved by Alberta Forestry, Lands and Wildlife and generally must abide by the same environmental standards as permanent access roads (see Section 8.1.3.1 - Permanent Roads).

Winter roads are a special category of temporary access roads. These roads are built for winter use only and use packed snow to create the road surface. The following guidelines for building winter snow roads should be noted:

1. Procurement of snow for construction and maintenance is permitted only from a pre-cleared right-of-way. Removal of snow from areas outside the right-of-way is permitted only with prior approval of the licensing authority.
2. Where winter roads will be subjected to unusually heavy traffic, the surface should be iced for added protection. This is achieved by packing the snow and spraying the surface with water.
3. Equipment used for winter clearing and for construction of snow roads should be tracked with a maximum gross weight not exceeding 12500kg. Vehicles used should not exert more than 55kPa.
4. For guidelines regarding stream crossings using ice bridges see Section 8.2 - Stream Crossings.

8.2 STREAM CROSSINGS

Many petroleum activities such as the construction of access roads, pipelines and seismic lines require stream crossings. Each of these activities is of environmental concern due to the potential for habitat destruction, increased stream sedimentation, bank erosion, constraint to fish passage and the possibility of introducing deleterious substances into the water. Guidelines which should be followed to minimize the problems outlined above are discussed in this section.

Table 8.2.1. is a quick reference which outlines environmental concerns, the location of information within this handbook and the regulatory contact for each environmental concern.

Under Section 11 of the Water Resources Act, a permit or licence is required from the Regional Services Branch of the Water Resources Administration Division, Alberta Environment for each operation which involves a stream crossing with defined bed and banks. For examples of permits, see Appendix D. The application procedure for stream crossings is outlined in Figure 2.6.

The guidelines require an Alberta Environment permit for the following watercourse crossings:

1. Crossings requiring a culvert capacity equal to or greater than 1.5m (5 feet) in diameter (the exception to this would be winter operation crossings that use an ice bridge or snow fill; in these situations no permit would be required regardless of the size of the crossing). This guideline applies in the Green Area only.
2. Crossings that require a bridge of more that one span, i.e., a native timber bridge of one span or a Bailey bridge would not require a permit. This guideline applies in the Green Area only.
3. All crossings associated with pipeline installation.

Stream crossings are classified as follows:

1. Permanent Bridges
2. Temporary Bridges
3. Ice Bridges
4. Fords
5. Corduroy Log Fills
6. Culverts
7. Pipeline Crossings.

Definitions of each type of stream crossing are provided in Section 8.2.2. Table 8.2.2 identifies the uses of the various crossing methods.

8.2.1 GENERAL ENVIRONMENTAL GUIDELINES APPLICABLE TO ALL STREAM CROSSINGS

Information available on environmental guidelines for stream crossings includes:

1. **Stream Crossing Guidelines, Operational Guidelines for Industry**

   Information: Document provides environmental protection practices for the planning, construction, maintenance and abandonment of stream crossings on Crown land.
   Available: Information Center, AFLW
   phone: (403) 427-3590.

2. **Environmental Handbook for Pipeline Construction**

   Information: Section within handbook deals with environmental impacts at water crossings.

   Available: Alberta Environment Library
   phone: (403) 427-5870.

3. **Fisheries Habitat Protection Guidelines**

   Information: Document outlines problems that arise from petroleum related exploration and suggests techniques to avoid them.

   Available: Fish and Wildlife Division, AFLW
   Phone: (403) 427-6734.

TABLE 8.2.1

SECTION 8.2 - STREAM CROSSINGS ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Sand, and Gravel Operations	8.3	• Alberta Environment Reclamation (427–6323) • Water Resources (427–7054) (see Appendix C for Water Resources Administration regional offices) • Fish and Wildlife (see Appendix C for regional offices of AFLW)
Erosion Control	8.5	• On Crown land contact Forestry and Public Lands regional offices (see Appendix C)
Access Roads	8.1	• Same as above
Seismic Surveys	3.3.6	• Same as above
Pipelines	6.3.2.9, 8.2.2.7	• Same as above
Protection of Fisheries and Habitat	8.2.2.6, 8.2.2.8 8.2.2.10	• Fish and Wildlife (see Appendix C for regional offices of AFLW)
Scheduling	8.2.2.8	• Same as above
Disposal of Excavated and Debris Material	8.2.2.9	• Alberta Environment (see Appendix C for Water Resources Administration regional offfices) • Fish and Wildlife (see Appendix C for regional offices of AFLW)

4. **Permit Application Procedure for Pipeline Crossings**

Information: Document provides application procedures and guidelines for pipeline stream crossings.

Available: Water Resources Administration Division, Alberta Environment
phone: (403) 427-6168.

The following general guidelines should be noted.

1. All pertinent information on stream crossings or interaction with streams, lakes or reservoirs must be submitted to Alberta Environment, Water Resources Administration Division for review. Prior approval in writing is required for each crossing. (See Appendix D for example of permits.)
2. Stream crossings, approaches and water diversion channels should be designed, constructed, operated and maintained to:
    a) prevent or minimize erosion at such crossings and within the flood plains
    b) withstand riverbed scour at high flows (see items 1 and 2 in Section 8.2.2.7)
    c) minimize changes in the natural flood level in the river
    d) prevent silt from entering the streams
    e) control backwater.

    For techniques or devices of erosion control, see Section 8.5.
3. Vehicles and equipment should be forbidden to operate in streams in the Green Area unless absolutely necessary and permission has been granted by Water Resources Administration Division, Alberta Environment.
4. Abandoned water diversion channels should be plugged to prevent stranding of fish.
5. Debris or soil should not be permitted to enter the water.
6. Explosives should not be used in waters with known fishery resources unless permitted in writing by the Chief Fishery Officer of Fish and Wildlife Division, Alberta Forestry, Lands and Wildlife.
7. In order to minimize stream disturbance, attempts should be made to design stream crossings at right angles to the stream.

Table 8.2.2

WATERCOURSE VEHICLE CROSSING METHODS

CROSSING METHOD	< 6m WIDE < 0.6 m DEEP			6 - 15m WIDE 0.6 - 1.0 m DEEP			> 15m WIDE > 1.0 m DEEP		
Ford	X								
Logfill or Swamp Mat	X	X							
Culvert	(X)	X		X	X				
Ice Bridge	(X)	X	X	X	X	X	X	X	X
Temporary Bridge	(X)	(X)	X	(X)	(X)	X	X	X	X
Existing Bridge	(X)	(X)	X	(X)	(X)	X	X	X	X
	Low	Moderate	High	Low	Moderate	High	Low	Moderate	High
	Environmental Sensitivity								

Notes

1. This table is intended as a general guide to environmentally acceptable crossing methods in the absence of specified conditions on Water Resources Permits. Other factors to be considered include: bed and bank composition and stability, bank height, water velocity, cost, and engineering requirements (such as type and weight of equipment, anticipated number of trips, and availability of materials). Details of crossing method must be outlined before a permit will be issued.
2. X the method is environmentally acceptable.

   (X) the method is environmentally acceptable, however, is not practical in most cases, considering lower environmental sensitivity and higher construction cost.
3. Environmental Sensitivity levels are defined below. Note that Alberta Forestry, Lands and Wildlife, Fish and Wildlife Division or Alberta Environment may define the sensitivity of a particular crossing.

Low
- no downstream water users, and
- sport fish absent or present in low numbers during non-sensitive time period

Moderate
- downstream water users, or
- warm water sport fish sensitive habitat within zone of potential crossing-related sedimentation

High
- downstream water users cannot tolerate increased sediment load, or
- cold water sport fish sensitive habitat within zone of potential crossing-related sedimentation

8.2.2 SPECIFIC ENVIRONMENTAL GUIDELINES FOR PARTICULAR STREAM CROSSINGS

8.2.2.1 Permanent Bridges

A permanent bridge is defined as a bridge which will be in place for more than 2 years and allows public access. A typical example is a highway bridge.

The following guidelines should be noted:

1. For design of bridges the user should consult in-house or contract expertise. Bridges should be designed to accommodate a 1:100 year flood. An additional clearance of 0.6m should be provided to permit the free passage of ice.
2. Approaches to bridges should not constrict the flood plain excessively. Backwater due to these approaches must be minimal.
3. Bridge piers or footings, where possible, should not be constructed within the main river channel. Where the river is so wide that in-channel construction is necessary, special measures are required to prevent stream scour. These include dykes and cofferdams.
4. River training works may be used to reduce the erosion of the river banks at the proposed bridge site for high water levels.
5. Berms used to construct the bridge approaches should be built entirely of granular material. Ninety (90) percent of this material should have grain size particles larger than 1mm. These are general guidelines; the applicant may be able to meet the objective of these guidelines by some other means.
6. Water from excavations returned to the stream should not contain more than 10 mg/l of sediment above the background level. These are general guidelines; the applicant may be able to meet the objective of these guidelines by some other means.

8.2.2.2 Temporary Bridges

Temporary bridges (Figure 8.2.1) are defined as bridges which will be in place for less than 2 years and will be removed at the end of a particular operation. Typical examples of such bridges include access road bridges to well sites, plants or gravel haul roads.

Temporary bridges must abide by the same environmental standards as permanent crossings. The following guidelines should be noted:

1. For design of bridges, the user should contact in-house or contract expertise. Portable bridges are recommmended for temporary crossings.
2. Temporary bridges must be constructed such that the deck is above the 1:25 year flood level with clearance for floating debris.
3. All temporary structures should be removed at the end of the operation or the end of the second year, and the area should be returned as closely as possible to its natural condition. Refer to Section 8.4 for details on reclamation procedures.

8.2.2.3 Ice Bridges

Ice Bridges (Figure 8.2.2) are temporary bridges which will be in place for less than 6 months and are either removed or destroyed by spring break-up. These bridges are built by taking advantage of the natural ice cover of lakes and streams. Aside from snow removal from the ice surface, only the approaches must be constructed for this type of a stream crossing. Ice bridges provide winter access to well sites and borrow pits and enable crossings of large rivers where the building of a bridge would be too expensive.

The following guidelines should be noted:

1. When designing an ice bridge the user should consult in-house or contract expertise.

   For actual operation, a thorough analysis of ice should be made by a qualified ice specialist.

   Gold's Formula can be used to approximate the permissible loading on an ice bridge. The formula is as follows:

   $P = Ah^2$

   where P = load in kilograms (short term load assuming vehicle is moving)
   h = ice thickness in centimetres
   A = constant (recommend 3.52) (Adam, 1978).
2. The thickness of ice at the crossing may be increased by pumping water onto the ice.
3. Logs or poles may be used as a base to strengthen the ice bridges. All logs or poles used in bridging operations must be removed before spring break-up. Removal of the structure is the responsibility of the operator. Explosives may be used to remove the crossing only after permission of the Fish and Wildlife Division, Alberta Forestry, Lands and Wildlife.
4. A channel must be maintained under the ice bridge in streams which normally do not freeze to the bottom to ensure fish passage.
5. When authority is granted for the construction of an ice bridge, only ice and snow may be used as the surface, and logs or poles as the base.
6. The operator must ensure that if equipment or trucks fall through the ice, measures are taken to contain the escape and release of any deleterious substances into the water body or onto the ice. Immediate measures must be taken to remove the equipment and/or other materials from the water body as well as all released substances. The Regional Fisheries Biologist is to be informed immediately of any release of deleterious substances (see Appendix C for contacts).

8.2.2.4 Fords

Fords (Figure 8.2.3) are defined as natural crossings at a shallow section (less than 1m deep) of a stream. Only streams with gravel or sand beds are suitable for ford crossings (AF&WD). Ford crossings are used in applications where the crossing will likely only be required once. Typical uses of fords include the initial entry of well drilling equipment or seismic crew crossings.

Fords are generally permitted in streams where fishery resources will not be endangered by the activity. Fords are authorized by the Regional Services Branch of the Water Resources Administration Division, Alberta Environment.

The following guidelines should be noted:

1. Generally, fords should not be wider than 15m.
2. The streambed must have a firm rubble bottom that will stand up to the amount of traffic that is to pass over it and therefore no fording will be permitted in streams with soft beds.
3. Access to the ford must not be on the outside of any bend in the watercourse.
4. Improvement of the crossing is limited to removal of large rubble or debris which would interfere with access.
5. Fords are restricted to users requiring a low frequency crossing (e.g. seismic crews, pipeline construction, initial entry of well drilling equipment).

8.2.2.5 Corduroy Roads and Log Fills

Log fills (Figure 8.2.4) are used to construct bridge approaches across streams. Log fills are used in intermittent drainages and must have their roots, branches and tops removed. Native timber bridges should be used on permanent streams.

Corduroy roads (Figure 8.2.5) are used on intermittent or permanent streams less than 6m wide and in areas where fish passage is not necessary. Corduroy roads are also used on bridge approaches. For corduroy roads, the following guidelines should be noted:

1. The logs must be trimmed and butted and should not exceed the width of the road.
2. The logs must be removed prior to break-up or on abandonment of the crossing, whichever comes first.
3. The logs should be bundled together to allow for easy placement and removal.

8.2.2.6 Culverts

Culverts (Figure 8.2.6) are used as conduits which transport water under a road. Several culvert types are used. Culverts are used for temporary or permanent stream crossings. The decision on whether to install a bridge or culvert over smaller streams depends on hydrological conditions of the particular stream, costs, and potential hazard to the fishery resource. Generally in fish bearing streams, a bridge is preferred rather than a culvert. If a culvert is to be used, it should be installed so that fish passage is maintained. Fisheries requirements on design may be obtained from the local Fisheries Biologist.

With respect to culverts, the following specific guidelines should be noted:

1. For culvert design the user should consult in-house or contract hydraulic expertise. The culvert must pass the required flow of water attained during peak flows. The culvert must also be structurally sound, not encourage sedimentation or scour, allow debris passage, permit fish passage where required and be cost effective.
2. The following culvert types are commonly used:
   a) Arch Culvert (Figure 8.2.7). This type of culvert may have either an open or a closed bottom. The open bottom type allows for natural riverbed material to be retained. The use of this type of culvert depends on the foundation conditions and depth of fill.
   b) Horizontal Ellipse (Figure 8.2.8). By lowering the culvert invert below the stream bed elevation, it is possible to take advantage of the wide middle portion of this culvert for maintaining stream flow width and, at the same time, maintaining natural river bed material in the culvert. Small barrier dams placed on the culvert bottom will provide some protection against the material washing out.
   c) Circular (Figure 8.2.6). This is the most common culvert shape. It is very impractical for fish passage, however, due to the circular geometry. As the river flows decrease, the flow area within the culvert also decreases and the high water velocities are retained.
   d) Multiple Culverts. A minimum of 1.8m should be established between adjacent culvert walls in a multiple culvert arrangement. This spacing will provide a backwater area (downstream end) for the fish to rest in before attempting passage. Multiple culverts are generally not recommended.
3. Culvert Size
   a) Temporary Crossings
      (i) Culverts for temporary crossings do not have to be designed for fish passage unless they are to be in-place at the time of fish passage.
      (ii) Maximum acceptable length of a temporary culvert where fish passage is necessary is 12m.
      (iii) Culverts less than 1m in diameter are not acceptable for fish passages in watercourses.

b) Permanent Crossings

(i) The culvert(s) should have sufficient capacity to pass the design flood (generally based on a minimum 50 year peak flow) with no backwatering or ponding at the upstream end of the culvert(s). There should also be a freeboard allowance for passage of debris.

4. Culvert Location

a) Crossings should be selected which do not require diversion of the watercourse.

b) The stream cut-offs or diversions should be kept to a minimum. Bypassing the natural stream loop (meander loop) increases the stream gradient within the diversion channel (in most cases, the culvert). The increased gradient causes higher velocities and a greater potential for erosion.

c) The upstream end of the new channel, in the case of diversions, must remain closed off until the channel is fully excavated to the desired width, depth and length; the stream flow may then be diverted into the new channel. The existing channel shall not be filled and blocked by excavated material until diversion into the new channel is completed.

d) The degree of skew of the stream crossing should be kept to a minimum, in order to minimize both culvert lengths and construction area.

5. Protection of Fishery Resources

One potential threat to the fishery resources from road, pipeline or bridge construction is that fish migrations or movements may be blocked. Poorly designed or installed culverts are responsible for the greatest percentage of fish passage problems (see Figure 8.2.9). The major problem associated with culverts is that of increased velocity. Normal culvert design practice is to reduce the channel cross-sectional area, the effect of which is to increase the velocity of flow within the culvert. The obstruction to fish may also result from water turbulence, or an inadequate stimulus for fish to swim through the structure. To encourage fish passage, the following guidelines should be considered:

a) If fish passage is required, a culvert must be laid below the existing streambed. The depth of burial will vary with the type of watercourse. Watercourses with silt-sand substrates have a limited slope. Burial on these will not be as great as those watercourses with a boulder-gravel substrate which usually have a steeper bed slope. For culverts up to 3 metres in diameter, the depth of burial in silt-sand substrates will be 1/4 of the diameter and, in boulder-gravel substrates, 1/3 of the diameter. In culverts greater than 3 metres, the influence of stream substrate on reducing water velocity in the culvert is minimal at times of high discharges, therefore, depth of burial becomes of less value. Burial for culverts greater than 3 metres in diameter should be 1.25m in streams with sediment substrates, and 1.75m in streams with rubble substrates.

b) Culverts should be designed so that the average cross-sectional velocity through any culvert section shall not exceed 0.5m/s during fish migration periods, unless it can be satisfactorily demonstrated that the culvert design includes a selected region wherein velocities are low enough to permit fish passage. This selected region must be continuous throughout the culvert length and of sufficient size to permit the fish to locate it and to swim through it. Velocity criteria need not be adhered to during the delay period in which culverts are permitted to be impassable to fish.

Generally, larger fish are able to move through faster waters than are smaller sized fish. For example, large salmonids tend to have burst speeds (instantaneous) as high as 7.9m/s (26ft./sec.) but that their critical swimming (sustained speeds for a relatively short distance) speed is 0.7m/s (2.0ft./sec.). In some cases for large fish this figure may approach 1.0m/s (3.ft./sec.) but for small fish 0.4m/s (1.3ft./sec.) is all they will be able to sustain (AF&WD, 1982).

c) If culvert velocity criteria cannot be met during migration periods, then alternative provisions for fish passage must be employed. The design velocities within the culvert may not be conducive to fish passage, therefore a fish passage facility must be built into the culvert. Energy dissipation baffles can be used to create a localized region of reduced velocities along the culvert bottom or sides. The same hydraulic principles utilized in fishway design (Clay, 1961) must be applied to baffle design if fish passage is to be effective.

d) Minimum water levels: the water levels within culverts are most likely to be critical during fall, since this is usually a period of low run-off from watersheds and is also the spawning period for a great number of fish species, especially the Coregonids. The depth of water in a culvert must be sufficient to submerge the largest fish which might use the structure.

A height of 20.3cm is considered the minimal water level permissible in culverts at any time during the open-water season, unless it can be shown that there is no requirement for fish passage through the culvert.

6. Installation and gradient: culvert inverts must be laid as per item 5 (a) above. When foundation conditions are such that a sagging of the central portion of the culvert is anticipated, the central portion should be installed with an upward chamber design. Anticipated sag will then tend to reform the culvert to a constant gradient. Sag in a non-chambered culvert can impose a passage problem for fish due to the increased culvert gradient on the upstream side of the sag.

   Inverts must be designed to prevent hydrostatic uplift at the downstream or upstream end. The culvert gradient is to be kept as close to 0% gradient as foundations and stream conditions permit, with the condition that upstream or downstream velocity barriers are not formed as a result. The maximum culvert slope that should be installed when employing a baffle configuration is 5%. Beyond the 5% slope, baffle effectiveness is inversely proportional to any increase in slope.

   If construction procedures permit, bolt connections should be installed with the bolt head on the culvert interior. This will help prevent fish being damaged on the sharp, nut and bolt end.

   The user should refer to Section 8.5 to obtain guidelines on erosion control and the use of rip-rap and gabions.

8.2.2.7 Pipeline Stream Crossings

Pipeline stream crossings can be undertaken by either building a bridge across a stream or utilizing an existing bridge, burying the pipeline under the stream or suspending the pipe across the stream. It should be noted that using an existing bridge is sometimes difficult because of structural constraints but should be considered as an alternative.

Another alternative is to auger underneath a stream. This is dependent, however, upon the width of the stream and geological conditions. Geological and engineering expertise must be consulted when considering this alternative. Submission of an "Application for Permit" form together with plans of the proposal must be directed to the appropriate regional office of the Water Resources Administration Division of Alberta Environment. All drawings, including any typical plans, are to bear the stamp and the signature of a professional engineer. Specific guidelines are as follows:

1. Pipelines carrying a polluting medium (oils, chemicals, etc.) must be designed for placement below the 1:100 year bed scour depth.
2. Pipelines carrying a non-polluting medium (gas, water, transmission line, etc.) must be designed for placement below the 1:50 year bed scour depth.
3. The pipeline and any associated protection works must be designed so that the hydraulic characteristics of the watercourse are not altered.
4. The pipeline must be designed to prevent any pipeline exposure due to bank migration during the life of the pipeline.

5. A professional engineer (registered with the Association of Professional Engineers, Geologists and Geophysicists of Alberta) must submit a letter or report certifying that the above pipeline guidelines have been met or exceeded, based upon the plans submitted. Where it is not practical to design within the guidelines, the engineer may explain why, in his professional judgement, the design prepared is adequate. Constant liaison should be maintained with the Water Resources Administration Division of Alberta Environment.

6. An analysis should be made to ensure that support structures are adequately protected from the effects of scour, channel migration, undercutting, ice forces and degradation of permafrost in northern areas.

7. Construction in flood plains should be accomplished in a manner to avoid channelization along the pipeline. Construction should be carried out during winter months in locations where the pipeline trench could be adversely affected by the water table. Impervious trench breakers should be installed along the pipelines to prevent seepage along the pipeline trench (see Figure 6.9b).

8. Pipe trench excavations should terminate at least 15m from watercourses, leaving an adequate protective plug (undisturbed material) at each bank. The plug should be left in place until the excavation in the stream bed is completed, and should not be removed until absolutely necessary.

   All materials removed from a trench on a watercourse less than 20m wide should be removed and piled up on land. In watercourses wider than 20m, materials should be discretely stockpiled in the channel, and not windrowed across the channel. The piles should be placed in such a manner as to avoid areas of fast flowing water. Excess spoil should not be piled in an area less than 100m away from the watercourse.

9. The pipeline should be buried below the depth of maximum bed scour across the full width of the stream and floodplain. A protective layer of granular material 1m thick (e.g. sand, gravel or rock) should be placed between the top of the pipeline and the maximum depth anticipated for scour.

10. All excavated material from the bed of the river should be removed to a site above the high-water mark in the interim preceding back filling of the trench.

11. If water is to be withdrawn from a fish bearing watercourse or any other watercourse or water body for hydrostatic testing of a pipeline or other short term uses, prior approval will be required from the Regional Services Branch of the Water Resources Administration Division.

    When conducting hydrostatic testing on a pipeline crossing, waterline heaters should be used in preference to antifreeze chemicals. At no time should chemically treated water be returned directly to a watercourse. Pretesting the stream crossing section of the pipe prior to placement is recommended as an alternative.

12. Pipeline crossings should be completed in as short a time as possible. Timing constraints due to fish spawning season depend on the species of fish living in the stream (i.e. spring spawning species vs fall spawning species). For more information regarding spawning constraints, see Section 8.2.2.8.

    Where information on the species composition is not available, the Fish and Wildlife Division of Alberta Forestry, Lands and Wildlife can provide information on time constraints. Where immediate use of the line is required but the construction cannot proceed due to fish spawning constraints, an alternate method of stream crossing should be considered. Such alternate methods may include fluming the crossing during construction.

13. In the first summer following construction, the stream crossing should be inspected weekly during the first month after break-up and monthly thereafter until freeze-up to detect erosion and to assess the adequacy of erosion control. Crossings should be inspected quarterly for at least the next two years and yearly during annual peak run-off periods thereafter.

14. Pipeline alignments should avoid crossing lakes and ponds. However, if crossing is necessary, approvals are required from the Regional Services Branch of the Water Resources Administration Division.

15. Submission of Formal Application for Permit

The permit application consists of a completed application form together with three copies of a location plan, a detail plan of the crossing and a letter confirming that the design guidelines have been met. The plan(s) should show the general configuration of the watercourse or water body and the location of the pipeline crossing.

If a surveyed cross-section was obtained for design purposes then it should be submitted. Unless otherwise requested, a typical cross-section will suffice for streams for which the design does not require surveyed cross-sections.

Application forms are available from all Regional Offices of the Water Resources Administration Division. The application form must be signed by the applicant and forwarded together with plans and related material to:

In the case of Regulated Pipelines (16km in length and 150mm in diameter or greater):
Land Conservation Co-ordinator, Land Reclamation Division, Alberta Environment
phone: 427-6323

In the case of Non-Regulated Pipelines (less than 16km in length and 150mm in diameter):
Regional Administrator, Water Resouces Administration Division, Alberta Environment

The location of the 5 Regional Offices are shown in Figure 2.15 with addresses and telephone numbers included in Appendix C.

8.2.2.8 Construction Scheduling

Many species of fish undertake migrations and may congregate in localized areas during their spawning period. Optimal production is achieved only if reproductive activities can occur during the specific time periods and under the environmental conditions to which the species' life cycle is adapted. For example, spawning migration delays for periods of as little as a few days can cause significant declines in egg production of some species of fish. A decline in successful spawning may be attributed to a delay in fish movement which in turn causes fish to overcrowd and attempt to spawn on unsuitable substrate. The eggs of fish are extremely sensitive to those conditions associated with waterflow, oxygen availability, the presence of toxic materials, and the deposition of silt. Due to the characteristics of the reproductive activities, fish can be seriously impacted by construction activities which result in:

1. Obstruction of fish passage by:
    a) fills which create total or partial blockage of the watercourse
    b) improperly installed or designed culverts that create outfalls or velocity barriers
    c) reduction of water depths to unacceptable levels through excessive water removal
    d) production of extended periods of point disturbance in or near watercourses causing avoidance reactions by migrants
    e) altering water quality in a portion of a water body to cause avoidance of the area by fish.
2. Direct lethal effects by:
    a) use of explosives in watercourses
    b) producing extremely high levels of turbidity
    c) use or spills of toxic chemicals in watercourses.
3. Increase egg/fry mortality by:
    a) causing siltation resulting in reduced percolation of water through spawning beds and also preventing escape of sac fry from the gravel
    b) physical disturbance of incubating eggs
    c) dewatering or freezing of incubating eggs.
4. Loss of fish food items by covering the habitat (gravel rock) of these organisms with silt.

Fall spawning fish release their eggs onto a particular substrate in September, October or November and these eggs remain in an egg stage, developing slowly, until March or April. Spring spawning fish are vulnerable for a shorter period of time, from April to June or July. The egg and fry stages tend to be the most vulnerable periods of time in the life cycle of fish, but other stages, including the adult, may be negatively impacted by construction activities in or near watercourses.

Timing constraints for construction could conceivably be used for any type of work that might cause release of sediment or a physical disturbance in a particular watercourse or water body. These guidelines are particularly necessary for pipeline and road construction across watercourses. These constraints will generally be placed on letters of authority through Public Lands Dispositions Section or on water licences and permits through Alberta Environment (AF&WD, 1980).

The following guidelines are based on existing knowledge and are subject to change as more information becomes available. Consult the Habitat Branch of AFLW for the latest information:

1. The province of Alberta is divided into nine major drainage basins. When one or more fish species of concern occurs in a watercourse or water body within a given drainage basin, construction in and around that watercourse or water body should not occur during the general timing constraint as outlined in Table 8.2.3 without approval of a Fisheries Habitat Biologist. Spawning periods, incubation dates and general timing constraints are identified in Table 8.2.3 for the nine major drainage basins for the following species of commercial and sport fish:

a)	Lake Sturgeon	*Acipenser fulvescens*	Spring spawning
b)	Arctic Grayling	*Thymallus arcticus*	Spring spawning
c)	Lake Whitefish	*Coregonus clupeaformis*	Fall spawning
d)	Mountain Whitefish	*Prosopium williamsoni*	Fall spawning
e)	Lake Trout	*Salvelinus namaycush*	Fall spawning
f)	Dolly Varden	*Salvelinus confluentus*	Fall spawning
g)	Brook Trout	*Salvelinus fontinalis*	Fall spawning
h)	Brown Trout	*Salmo trutta*	Fall spawning
i)	Cutthroat Trout	*Salmo clarki*	Spring spawning
j)	Rainbow Trout	*Salmo gairdneri*	Spring spawning
k)	Golden Trout	*Salmo aguabonita*	Spring spawning
l)	Northern Pike	*Esox lucios*	Spring spawning
m)	Goldeye*	*Hiodon alosoides*	Spring spawning
n)	Yellow Perch	*Perca flavescens*	Spring spawning
o)	Sauger	*Stizostedion canadense*	Spring spawning
p)	Walleye	*Stizostedion vitreum vitreum*	Spring spawning

2. Where precise information in species composition for a specific stream or section of stream is available, timing constraints may be adjusted accordingly by a Fisheries Officer.

* Also includes Mooneye *Hiodon tergisus*

Table 8.2.3
TIMING CONCERNS FOR VARIOUS SPECIES OF ALBERTA FISHES
(AF&WD, 1980)

- Lake Sturgeon *Acipenser fulvescens* (spring spawner)

Drainage Basin	**Spawning Time**	**Incubation Complete**	**General Timing Constraint**
South Saskatchewan River	June 25 - July 15	July 23	June 20 - August 1
North Saskatchewan River	June 25 - July 15	July 23	June 20 - August 1

- Arctic Grayling *Thymallus arcticus* (spring spawner)

Drainage Basin	**Spawning Time**	**Incubation Complete**	**General Timing Constraint**
Churchill River	April 23 - April 30	June 22	April 18 - June 27
Athabasca River	April 23 - June 10	June 30	April 20 - July 5
Peace River	April 23 - June 10	June 30	April 20 - July 5
Hay River	April 23 - June 10	June 30	April 20 - July 5

- Lake Whitefish *Coregonus clupeaformis* (fall spawner)

Drainage Basin	**Spawning Time**	**Incubation Complete**	**General Timing Constraint**
South Saskatchewan River	Sept 25 - Dec 30	May 25	Sept 28 - May 30
North Saskatchewan River	Sept 28 - Dec 30	May 25	Sept 28 - May 30
Churchill River	Oct 1 - Dec 5	May 25	Sept 28 - May 30
Athabasca River	Oct 1 - Jan 30	May 25	Oct 1 - May 30
Peace River	Oct 1 - Jan 30	May 25	Oct 1 - May 30
Hay River	Oct 1 - Jan 30	May 25	Oct 1 - May 30
Slave River	Oct 1 - Jan 30	May 25	Oct 1 - May 30
Liard River	Oct 1 - Jan 30	May 25	Oct 1 - May 30

- Mountain Whitefish *Prosopium williamsoni* (fall spawner)

Drainage Basin	**Spawning Time**	**Incubation Complete**	**General Timing Constraint**
Milk River	Sept 1 - Oct 23	April 1	Sept 1 - April 5
South Saskatchewan River	Sept 15 - Oct 23	April 1	Sept 10 - April 5
North Saskatchewan River	Sept 15 - Oct 23	April 1	Sept 10 - April 5
Athabasca River	Sept 15 - Oct 23	April 1	Sept 10 - April 5
Peace River	Sept 15 - Oct 23	April 1	Sept 10 - April 5

Table 8.2.3 (continued)

TIMING CONCERNS FOR VARIOUS SPECIES OF ALBERTA FISHES

- Lake Trout *Salvelinus namaycush* (fall spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
South Saskatchewan River	Sept 15 - Oct 15	April 1	Sept 10 - April 5
North Saskatchewan River	Sept 15 - Oct 15	April 1	Sept 10 - April 5
Churchill River	Sept 15 - Oct 15	April 1	Sept 10 - April 5
Athabasca River	Sept 15 - Oct 15	April 1	Sept 10 - April 5
Peace River	Sept 15 - Oct 15	April 1	Sept 10 - April 5
Slave Lake	Sept 15 - Oct 15	April 1	Sept 10 - April 5

- Dolly Varden *Salvelinus confluentus*(fall spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
South Saskatchewan River	Sept 1 - Oct 1	March 20	Sept 1 - March 25
North Saskatchewan River	Aug 15 - Oct 1	March 20	Aug 10 - March 25
Athabasca River	Sept 1 - Oct 30	March 20	Sept 1 - March 25
Peace River	Sept 1 - Oct 30	March 20	Sept 1 - March 25

- Brook Trout *Salvelinus fontinalis* (fall spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
South Saskatchewan River	Sept 15 - Nov 15	March 20	Sept 15 - March 25
North Saskatchewan River	Sept 15 - Nov 15	March 20	Sept 15 - March 25
Athabasca River	Oct 1 - Nov 15	March 20	Oct 1 - March 25

- Brown Trout *Salmo trutta* (fall spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
Milk River	Sept 15 - Nov 15	March 20	Sept 15 - March 25
South Saskatchewan River	Sept 15 - Nov 15	March 20	Sept 15 - March 25
North Saskatchewan River	Oct 1 - Nov 15	March 20	Sept 25 - March 25

- Cutthroat Trout *Salmo clarki* (spring spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
South Saskatchewan River	June 2 - June 25	August 10	May 27-Aug 15
North Saskatchewan River	May 20 - June 25	August 10	May 20 - Aug 15

Table 8.2.3 (continued)
TIMING CONCERNS FOR VARIOUS SPECIES OF ALBERTA FISHES

- Rainbow Trout *Salmo gairdneri* (spring spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
Milk River	May 15 - June 15	August 15	May 15 - Aug 15
South Saskatchewan River	May 1 - June 15	July 15	May 1 - July 15
North Saskatchewan River	April 15 - June 15	July 15	April 15 - July 1
Athabasca River	May 15 - June 15	August 15	May 15 - Aug 15

- Golden Trout *Salmo aguabonita* (spring spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
South Saskatchewan River	June 1 - June 30	August 21	May 25 - Aug 25

- Northern Pike *Esox lucios* (spring spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
Milk River	May 1 - June 1	July 1	May 1 - July 1
South Saskatchewan River	May 1 - June 1	July 1	May 1 - July 1
North Saskatchewan River	April 15 - May 20	July 1	April 15 - July 1
Churchill River	April 15 - May 20	July 1	April 15 - July 1
Athabasca River	April 15 - June 10	July 15	April 15 - July 15
Peace River	April 15 - June 10	July 15	April 15 - July 15
Hay River	April 15 - June 10	July 15	April 15 - July 15
Slave River	April 15 - June 10	July 15	April 15 - July 15
Liard River	April 15 - June 10	July 15	April 15 - July 15

- Goldeye *Hiodon alosoides** (spring spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
South Saskatchewan River	May 15 - July 15	August 15	May 15 - Aug 15
North Saskatchewan River	May 15 - July 15	August 15	May 15 - Aug 15
Athabasca River	May 15 - July 15	August 15	May 15 - Aug 15
Peace River	May 15 - July 15	August 15	May 15 - Aug 15
Slave River	May 15 - July 15	August 15	May 15 - Aug 15

* Mooneye *Hiodon tergisus* follows the same drainage basins and timing constraints as goldeye.

Table 8.2.3 (continued)
TIMING CONCERNS FOR VARIOUS SPECIES OF ALBERTA FISHES

- Yellow Perch *Perca flavescens* (spring spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
South Saskatchewan River	April 15 - June 1	July 1	April 15 - July 1
North Saskatchewan River	April 15 - June 1	July 1	April 15 - July 1
Churchill River	April 15 - June 1	July 1	April 15 - July 1
Athabasca River	April 15 - June 1	July 1	April 15 - July 1
Peace River	April 15 - June 1	July 1	April 15 - July 1
Slave River	April 15 - June 1	July 1	April 15 - July 1

- Sauger *Stizostedion canadense* (spring spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
Milk River	May 1 - June 1	June 30	May 1 - June 30
South Saskatchewan River	May 1 - June 1	June 30	May 1 - June 30
North Saskatchewan River	May 1 - June 1	June 30	May 1 - June 30

- Walleye *Stizostedion vitreum vitreum* (spring spawner)

Drainage Basin	Spawning Time	Incubation Complete	General Timing Constraint
South Saskatchewan River	April 15 - June 1	June 30	April 15 - June 30
North Saskatchewan River	April 15 - June 1	June 30	April 15 - June 30
Churchill River	April 15 - June 1	June 30	April 15 - June 30
Athabasca River	April 15 - June 1	June 30	April 15 - June 30
Peace River	April 15 - June 1	June 30	April 15 - June 30
Hay River	April 15 - June 1	June 30	April 15 - June 30
Slave River	April 15 - June 1	June 30	April 15 - June 30
Liard River	April 15 - June 1	June 30	April 15 - June 30

8.2.2.9 Disposal of Excavated and Debris Material

All debris from clearing or construction operations should be removed from the stream and the adjacent area and be disposed of through burning, chipping, or other agreed upon methods (see Section 8.4), or placed in such a manner that it cannot enter the stream. Where possible, clearing and removal of debris adjacent to streams should be done by hand. The disposal areas for this type of material must be located well away from any stream or water body.

Limbed logs used as reinforcement material in snow or ice stream crossings must be removed from the stream and flood plain prior to spring break-up.

8.2.2.10 Habitat Protection

Where it can be demonstrated that a specific habitat is required to maintain a particular fish species, the proponent may be required to restore the original habitat, as much as possible, to its natural state and to the satisfaction of a Fishery Officer. The following guidelines should be noted:

1. Clearing of vegetation adjacent to water bodies should be kept to a minimum. Use of herbicides is prohibited within 30m of a water body (see Section 8.11).
2. Gravel should not be removed from stream beds without consulting a Fisheries Officer. The removal of stream gravel may seriously damage spawning sites. Also, stream bed alterations resulting from gravel removal can cause obstruction to migrating fish and increase the level of suspended sediment (see Figure 8.2.9). Removing gravel from a stream or from the river bed requires an approval pursuant to the Water Resources Act. Approval is obtained from the Regional Services Branch of the Water Resources Administration Division.
3. Restoration of habitat may include reconstruction of overhang banks or re-establishment of overhanging vegetation and shade cover (see Figure 8.2.10).

8.2.2.11 Maintenance

The following maintenance guidelines should be noted:

1. Icing: Due to the shaded conditions within the culvert and also due to the heat transfer characteristics of steel, a culvert is often the source of an ice build-up problem. The build-up of ice occurs within the culvert during the winter, and when spring floods occur this ice acts as a dam, causing upstream ponding and possible overtopping of the roadway. Ice dams have also been known to occur in the shaded section beneath a large bridge. Ice dams should be removed as much as possible.
2. Inspections: Periodic inspections of all culvert installations should be conducted prior to and during spring break-up. Culverts found to be blocked by debris or in-culvert icing should be cleared. A regular program of culvert steaming will probably be required in northern portions of Alberta.

8.3 SURFACE MATERIALS

Industrial activity of all types require surface materials in various phases of their operations.

Surface materials are considered under the Public Lands Act to be the following:

1. gravel or sand and gravel
2. sand only
3. silica sand
4. topsoil
5. peat
6. manufacturing clay
7. non-manufacturing clay
8. marl.

The process for surface material extraction depends on whether the material is located on Public or patented land. Table 8.3.1 is a quick reference which outlines environmental concerns, the location of information within this handbook and the regulatory contact for each environmental concern.

8.3.1 PUBLIC LANDS

On Public lands there are four distinct stages to the removal of surface materials. These are:

1. Obtain a Surface Materials Exploration Licence
   A proponent who wishes to explore for surface materials must have an exploration licence which can be obtained for a fee of $50. This is a one time only application and is good for the life of the company or individual applying.
   Application for an exploration licence is by letter to the Manager of Exploration Approvals, Operations Section, Forest Land Use Branch, AFLW (see Appendix C for contact address and telephone number).
2. Prepare an Application to Explore
   Once a proponent has a licence to explore, testing for surface materials will likely be necessary. A letter of intent is required which should include some basic information as follows:
   a) address of proponent
   b) legal description of the exploration area
   c) method of testing (line spacing, hole size, equipment to be used, etc.)
   d) map showing proposed test area access routes
   e) debris disposal plan
   f) return address.
3. Apply for the Licence or Lease to Remove Surface Materials
   After the material is tested and verified there are three options for licensees to remove the material:
   a) A Public Pit Licence (PPL): A public pit licence can be applied for at any Alberta Forest Service or Public Lands Division office. At these offices the proponent can obtain a licence for the volume of material required at the public pit nearest the proponent's operation. Some pits may have volume limits. A surcharge is added to the cost of every yard of material removed to cover the cost of final site reclamation. The proponent will be given a copy of the operating plan for the pit, which includes a plan of the pit, and the operating conditions for the pit.

TABLE 8.3.1

SECTION 8.3 - SURFACE MATERIALS ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Surface Rights (PPL) (SMC) (SML)	2.3, Table 2.1 8.3	• Surface Rights Surface Materials Unit, Special Lands Disposition Section (427-3570)
Acess Roads	8.1	• See Appendix C for Forestry or Public Lands regional field personnel from AFLW
Quarriable Minerals (MSL)	8.3.2, 8.3.4	• Supervisor Industrial Leasing Unit (427-3570)
Clearing/Brush Disposal, Timber Salvage	3.3.2	• Same as above
Erosion Control	8.5	• Same as above
Development and Reclamation (D & R) Approval	8.3.3, 8.4	• Supervisor, Sand and Gravel, Alberta Environment (427-6323)
Development on Patented Lands	8.3.3,	• Same as above
Exploration Licences	8.1	• Manager of Exploration Approvals, AFLW (427-3582)
Reclamation Certificates on Crown Land	8.1, 8.4	• Deputy Secretary, Land Conservation and Reclamation Council, Alberta Environment (427-6212)
Site Selection	8.3	• On patented land contact Alberta Environment (427-6323) • On Crown land contact Forestry or Public Lands regional offices (See Appendix C)
Surface Runoff	8.3.3, 8.7.7.3	• Alberta Environment (see Appendix C for Regional Water Resources Administration offices)
Reclamation	8.4.1	• Alberta Environment (427-6323) or AFLW (See Appendix C for regional offices of Forest or Public Lands Officers)
Restoration and Revegation	8.4.4	• Same as above

TABLE 8.3.1 (Continued)

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Stripping of Topsoil and Vegetation	8.3.3	• Same as above
Excavation	8.3.3	• Same as above
Weed Control	8.3.3 8.11	• Alberta Environment Pesticides Branch (427–5855)
Terrain Stabilization	8.5	• On patented land contact Alberta Environment (427–6323) • On Crown land contact Forestry or Public Lands regional offices (see Appendix C)
Scheduling, Wildlife and Habitat Protection	3.3.7, 8.3.3 8.2.2.8 6.3.2.3	• Fish and Wildlife (see Appendix C for regional offices of AFLW)

b) A Surface Material Licence (SMC): From time to time the material required may be available on Public land near the proponent's operation but not in a public pit. As a result, a surface material licence is required. The SMC application should include a proposed operating plan, intended access and a security deposit of $250 per acre. The SMC licence is usually used on small material deposits that could be completely extracted on one occasion. The licence holder will be responsible to reclaim the site and receive a reclamation certificate for it before the security deposit is refunded. A surface materials licence can be applied for at any Alberta Forest Service or Public Lands Division office. A surface materials licence limits the proponent to the volume designated in the application, does not give the proponent any interest in the property and is issued for up to a one year time period.

c) A Surface Materials Lease (SML): A surface materials lease entitles the proponent as the disposition holder to remove whatever volume of material required from the site and grants exclusive right to the operator to remove surface materials. The disposition is good for up to ten years. The process of exploration, application, and the responsibility of reclamation of the site are the same as required for a surface materials licence.

4. Decommission the Operations

Once the surface material is removed and the operation is no longer required, the requirements to decommission the site are dependent on the type of disposition the proponent is working under. The levels of responsibility are as follows.

a) Public Pit Licence: If the proponent has complied with the operating plan and operating conditions no futher work is required. The surcharge payment will cover the cost of seed and fertilizer, etc. after the public pit is depleted.

b) Surface Materials Licence: After the proponent has completed the operation the site will have to be reclaimed to the specifications defined by the AFLW. Generally this includes debris disposal, back sloping, ensuring adequate drainage, proper erosion control and revegetation of the site. Once this has been accomplished the proponent may apply for a reclamation certificate from the Deputy Secretary of the Land Conservation and Reclamation Council (see Appendix C for contact address).

8.3.2 QUARRIABLE MINERALS ON PUBLIC LANDS

From time to time the material a proponent has chosen to extract might be from the list of quarriable minerals.

Quarriable minerals are considered to be the following:

Anhydrite
Barite
Bauxite
Bentonite
Diatomite
Dolomite
Epsomite
Granite Rock
Gypsum
Limestone
Marble
Mica
Mirabilite
Potash
Quartz Rock
Phosphate
Sandstone
Serpentine
Shale
Slate
Talc
Thenardite
Trona
Volcanic Ash

The process to extract a quarriable mineral is similar to a surface materials lease (SML). The difference is that a mineral surface lease (MSL) is required for the site. The mineral surface lease application is reviewed by AFLW in the same manner as a surface materials lease. The MSL application will require exploration approval, the operating plan, intended access, and a security deposit in a similar fashion as a surface materials lease. Applications for both mineral and surface rights are submitted and reviewed by the Land Management and Development Branch who refers them to the Minerals Branch of AFLW.

8.3.3 SURFACE MATERIAL ON PATENTED LAND

The operation of a large pit for the removal of sand, gravel, clay or marl is authorized under the Sand, Gravel, Clay and Marl Surface Operations Regulation (AR 228/82). Reclamation of all pit operations is covered under Part III of the Land Surface Conservation and Reclamation Act. The reclamation of quarries on private land must also meet the "minimum reclamation requirements of the Land Conservation and Reclamation Council".

Removal of sand, gravel, clay or marl is defined by two categories:

1. "Large Pit Operations": pit operations that have or will disturb 5 acres or more of land. "Large Pit Operations" are designated as Regulated Surface Operations and require a Development and Reclamation (D & R) Approval.
2. "Small Pit Operations": pit operations that will remain less than 5 acres in size. These "Small Pit Operations" do not require a D & R Approval but must be reported to the Manager of the Land Conservation and Reclamation Council and must be reclaimed to the standards of the Council.

As indicated above, D & R approvals are required for large pit operations. The D & R approval sets the development and reclamation conditions and standards. One objective of the approval is to ensure reclamation planning is initiated at the earliest stage of pit development.

D & R approval application information requirements include a development and reclamation plan and written description of material salvage and replacement procedures. Application information can be found in the Sand and Gravel Manual which can be obtained by contacting the Supervisor, Sand and Gravel Section, Alberta Environment.

In all cases, reclamation of both large and small pit operations, as well as quarries, is required to meet the Land Reclamation Council's minimum reclamation requirements (see Section 8.4 for guidelines on reclamation).

In addition, for large pit operations a security deposit is required pursuant to the Security Deposit Ministerial Regulations AR 242/82. The security deposit is based on $250 per acre of disturbed and sanctioned under the D & R approval.

The proponent should also recognize that permits and licences for washing operations, water diversion, settling pond construction or operating adjacent to a water body or river may be required. These permits and licences will be identified during the application review process. For preliminary disclosure of required permits and licences contact the Supervisor, Sand and Gravel Section.

A flow chart of the application procedure is shown in Figure 8.3.1. The guidelines and requirements a proponent should consider are as follows:

1. Wherever possible, existing sites should be used in preference to new sites.
2. Boundaries should be shaped to blend into the natural landscape. The primary emphasis should be placed on the prevention of soil erosion (see Figure 8.3.2).
3. An area should not be considered for a gravel or borrow pit if it is located on an active flood plain, lake shore or in a stream channel.
4. Operations should be screened from roadways, lakes or camps using a buffer zone of uncleared vegetation (see Figure 8.3.3).
5. All topsoil should be stripped from the surface and stockpiled for reclamation of disturbed areas.
6. All overburden should be stripped and stockpiled for reclamation of disturbed areas.
7. Before excavation, the surface vegetation should be cleared and disposed of in an environmentally acceptable manner.

8. Gravel or borrow pit material should not be removed within the vicinity of any structure, such as a well head.
9. During excavation, the maximum cut slope of the mine face should be such that the operation does not create a hazard to the operator or the public.
10. When a pit is abandoned prior to exhaustion of the material, interim reclamation may be required.
11. The lease area should be kept free of noxious weeds.
12. All disturbed areas on any bed or bank should be kept to a minimum, stabilized, and revegetated as soon as possible to prevent erosion.
13. An undisturbed buffer may be required adjacent to property boundaries.
14. All pit operations should be properly drained to prevent ponding.
15. Upon exhaustion of supply, all disturbed areas should be reclaimed and revegetated.
16. There may be constraints in key wildlife areas.

8.3.4 QUARRIES ON PATENTED LAND

As with Public lands, quarries can be developed on patented lands. The requirements for a quarry development on patented land are:

1. A Quarriable Mineral Lease must be obtained from the Mineral Resources Division of Alberta Energy.
2. A permit must be granted under the Quarries Regulation Act from the Director of Mines, Department of Community and Occupational Health, Occupational Health and Safety Division.
3. Proof of ownership of the land or a lease granting permission to use the land must be provided.
4. Although no reclamation approvals are required prior to starting the quarry, reclamation is required under the Land Conservation and Reclamation Act to the standards of the Land Conservation and Reclamation Council. Contact should be maintained with Alberta Environment, Land Reclamation Division and reference should be made to Section 8.4 of the handbook for guidelines on reclamation.

8.4 RECLAMATION AND CONSERVATION

The Land Surface Conservation and Reclamation Act is the primary legislation guiding reclamation in Alberta. This Act applies to Public and private lands and provides for the establishment of the Land Conservation and Reclamation Council. The council members ensure that coordination occurs between the Land Surface Conservation and Reclamation Act and The Public Lands Act, which authorizes surface dispositions and provides for specific conditions of use on Public lands. Figure 2.5 outlines the procedure for obtaining a Development and Reclamation (D & R) approval. Reclamation is a broad term used to describe activities involved in the restoration of disturbed sites. The objective is to reclaim disturbed areas to a state consistent with the potential use of the area. For example, within the Green Area (forested Public land) the land is normally relaimed to a condition which will:

1. establish a self-sustaining vegetation cover which stabilizes the soil
2. eventually produce forest growth for harvest or some other suitable use.

In the White Area (agricultural land) the land is normally reclaimed to permit use either for livestock grazing or for crop production.

The following definition by the Land Surface and Reclamation Council on land capability is worth noting.

> The Land Surface and Reclamation Council ("the Council") defines "land capability" as the ability (i.e. ability unaltered by any level of future management inputs, activities or alterations) of land resources to support a given land use on a sustained basis. Land capability refers to an evaluation of the chemical and physical characteristics of land and determination of inherent or natural abilities and conditions which are the result of alterations or management practices prior to the development.

The incentive for requiring proponents to obtain a D & R approval is to ensure:

1. The planning and operation of a development is undertaken in a manner that will anticipate problems and minimize the effects of the surface disturbance.
2. Identification and commitment to the details of reclamation.

This section outlines the D & R approval process for pipelines and sand, gravel operations and in situ oil projects (see Figure 2.5).

Each project, whether or not it requires a D & R approval (e.g. Regulated or Non-Regulated), requires a Reclamation Certificate at the completion of the project. In general, AFLW provides reclamation certificates for non-regulated activities (e.g. well sites, production sites, access roads, geophysical operations) on Public land. Alberta Environment issues reclamation certificates for all regulated activities in Alberta and for all non-regulated activities on private land.

The concept of reclamation of disturbed lands has been defined by Alberta Environment and can be summarized as follows:

1. All surface activities should be designed and operated in a manner that will minimize the effects of the disturbance (i.e. re-contouring) and enhance the reclaimed potential of the disturbed lands (i.e. improved surface drainage).
2. Surficial material should be handled in a manner that ensures protection of soil, prevention of silt entering streams and surface erosion (see Section 8.5).
3. The ground surface should be stabilized to minimize hazardous conditions and to protect the surface against wind and water erosion.
4. Groundwater aquifers should be protected.

In land reclamation every site produces its own specific problems. Since no specific guideline would be applicable in all situations and because of the high cost of reclamation, it is of the utmost importance that the person in charge of a project establishes a working relationship with the field representative of the government agency responsible for inspection of the site or right-of-way. For Public lands, it is generally the District Forest or Public Lands Division Office in the area. For private lands and for all regulated projects, Alberta Environment's member of the Land Conservation and Reclamation Council and the landowner should also be contacted (see Appendix C for the members of the Land Conservation and Reclamation Council).

Alberta Environment and Alberta Forestry, Lands and Wildlife have established minimum reclamation requirements in Section 39, Part 3 of the Land Surface Conservation and Reclamation Act. These are the minimum requirements that the Land Conservation and Reclamation Council will apply in assessing whether the reclamation of lands has been satisfactory. Terms and conditions specified in Exploration approvals, Development and Reclamation approvals, or land surface dispositions and agreements will take precedence.

These minimum requirements are not intended to be an abridgement of the Council's "Guidelines for the Reclamation of Land in Alberta" or specific standards developed by land managing agencies, but as a quick reference for operators preparing and managing sites subject to the Council's inquiry and certification procedures. Any exceptions to these standards will be determined by the Council.

These standards are as follows:

1. All surface disturbances should be kept to a minimum, with appropriate measures taken to control wind and water erosion.
2. All trees should be salvaged or removed and disposed of by burning or other methods as approved by the Council.
3. Topsoil, including the surface organic horizon of the soil profile, should be selectively removed from the disturbed area and conserved for the reconstruction of the root zone.
4. All debris from the operator's equipment and facilities should be removed from the site and all solid materials should either be removed, or when necessary, buried with a minimum of 1.20m of soil cover.
5. The disturbed area should be recontoured to conform to the surrounding topography.
6. Topsoil and root zone material should be spread evenly over the entire area after it has sufficiently settled.
7. Areas where vegetation has been disturbed should be cultivated or conditioned to be compatible with adjacent or post-disturbance land uses.
8. On Public lands the operator should attain a permanent maintenance-free plant cover that is compatible with vegetation on adjacent undisturbed lands.
9. Proper land management and reclamation, including erosion control, and debris and waste disposal, should be conducted as the site operations progress.

This section of the handbook will provide guidelines for:

1. preparation of reclamation plans for regulated operations
2. reclamation of general activities (e.g. drilling sites, access roads, seismic lines, pipelines, and production sites) in forested and non-forested areas
3. spill cleanup
4. revegetation.

Table 8.4.1 is a quick reference which outlines environmental concerns, the location of information within this handbook and the regulatory contact for each environmental concern.

8.4.1 RECLAMATION PLANS FOR REGULATED OPERATIONS

8.4.1.1 Pipelines

According to the Regulated Oil and Gas Pipeline Surface Operation Regulation (see Appendix A1, Land Surface Conservation and Reclamation Act), a regulated pipeline is defined as one that is both 150mm or more in diameter and 16km or more in length.

The handbook user should review a document entitled "Information Requirements for Regulated Pipelines, 1987", Land Reclamation Division, Alberta Environment. Much of the information within this section is obtained from this document.

TABLE 8.4.1

SECTION 8.1 - RECLAMATION AND CONSERVATION ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Land Capability	8.4	• The Land Surface Reclamation Council (427-6212) (See Appendix C for regional offices).
Reclamation	8.4	• Same as above on regulated lands. • For non-regulated lands contact AFLW (427-3570).
Development and Reclamation Plans		
Pipelines	8.4.1.1	• Alberta Environment Land Conservation and Reclamation Division (427-6323).
Sand and Gravel	8.4.1.2	
In situ Oil Projects	8.4.1.3 7.2.1, 7.2.2	
Resource Information (Soils, climate, topography, water vegetation, fish and wildlife	Appendix B	• Air Photos (427-3519). • Maps (427-3520 or 297-7389).
Debris Disposal	8.4.2.1	• See Appendix C for Forestry regional offices of AFLW.
Rollback of Debris	8.4.2.1	• Same as above
Burning	8.4.2.1	• Same as above
Reclamation Certificates	8.4, 8.10.1	• For regulated areas see Appendix C for regional offices of Lands Surface and Reclamation Council. • For non-regulated areas contact AFLW (427-3570).
Reclamation of Seismic Lines	8.4.2.1 Section 3	• Same as above
Reclamation of Access Roads	8.4.2.1 Section 8.1	• Same as above
Reclamation of Pipelines	8.4.2.1 Section 6	• See Appendix C for the regional Land Conservation and Reclamation Council offices.
Revegetation	8.4.4, 8.4.2.1, 8.5.2.7, 8.11.1	• Same as above

TABLE 8.4.1 (Continued)

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Seed Application	8.4.4	• See Appendix C for the regional Land Conservation and Reclamation Council offices.
Abandonment of Roads, Seismic Lines	8.4.2.1	• See Appendix C for forestry regional offices of AFLW.
Reclamation in Non-Forested Areas	8.4.2.2	• See Appendix C for the regional Land Conservation and Reclamation Council offices.
Topsoil Conservation	8.4.2.2	• Alberta Agriculture (427–5373).
Soil Compaction	8.4.2.2	• See Appendix C for the regional Land Conservation and Reclamation Council offices.
Erosion Control	8.4.2.2 Section 8.5	• Same as above
Spills and Clean-up (oil, saltwater, elemental sulphur, long term facility development, glycol spills)	8.4.3	• ERCB (297-8311)

The Development and Reclamation (D & R) application is an interpretation of environmental concerns that may be affected by the project, together with the appropriate mitigative measures. Applications for D & R approval are expected to reflect the best practical technology and should indicate the following:

1. Project description including:
   a) purpose of the project
   b) length and diameter of line
   c) terminal locations and other control points
   d) pipeline commodity, operating pressure and level of any sour gas well (as defined by ERCB ID 87-2)
   e) ancillary facilities such as camps, access roads and power lines
   f) project schedule.
2. Selection of alternative routes:

   The major environmental factors that will influence pipeline routing and construction should be identified and documented. A checklist of environmental concerns affecting pipelines is available from Alberta Environment, Land Reclamation Division upon request. The land-use and resource features of the area where alternative routes will be considered should be described.
3. Selection of the preferred route:

   An overall comparison of the environmental trade-offs and costs associated with the alternative routes should be included. The preferred route should be selected on the basis of least environmental impact, as well as engineering and cost factors.

   The alternative routes should be compared with respect to the major land-use and resource features, such as:
   a) agriculture
   b) forestry
   c) fish and wildlife
   d) recreation
   e) residences
   f) environmentally sensitive areas
   g) potentially affected mineral resources.

   Quantitative measurements should be used. The significance of each route's impact upon each major land-use and resource should be discussed and the reason for the selection of the preferred route identified.

   Information on incorporating environmental matters into route selection is included in "The Route Selection Process: A Biophysical Perspective", Alberta Forestry, Lands and Wildlife.
4. Investigations for the preferred route:

   An inventory of select environmental components, which may be impacted by the pipeline, may be required. Soils investigations however, are usually required when the preferred route traverses agricultural lands. Proponents should use the Soil Survey and Surficial Geology Reports published by the Alberta Research Council and any other existing soils information (see Appendix B). No field collection of soils information is required where a soil survey of the area exists at a scale of 1:14 or greater or where the pipeline would parallel an existing line for which a soil evaluation has been completed. Where existing information indicates that there will be no solonetzic soils, saline soils or problem parent materials along the length of the line, field investigation must be done only to verify the absence of problem parent materials. For non-problem soils, sufficient field inspections should be conducted to determine appropriate soil handling procedures.

   In general, detailed soil evaluations are necessary where existing soil information indicates the presence of saline soils, solonetzic soils or saline parent materials that require special mitigation measures.

If problem soils are encountered, two to five soil inspections per kilometre should be performed and soil samples taken from the A, B, and C horizons of each soil type. Soil sampling and analysis should be performed according to the "Manual on Soil Sampling and Methods of Analysis" (McKeaque, ed 1978). This document can be reviewed at the Land Reclamation Division, Alberta Environment.

An additional document, "Soil Conservation and Pipeline Construction" is also available from the Land Reclamation Division.

The collected, analyzed, and evaluated soils data should be documented in the Development and Reclamation application in both report and map form.

The soil evaluation report is required to describe the soils that will be disturbed by the project. Inspection and sampling densities, sampling techniques, analyses performed, and analytical methods used should be in the report when soil investigations have been done.

Interpretation and correlation of soil information with the proposed disturbance is essential.

A soil map is required as part of the Environmental Protection Plan (see item 6). The map is composed of map units which depict sets of related soil and landform characteristics. For pipeline construction, the map units display those characteristics which will have implications for soil handling or reclamation. Soil handling units are developed from the soil map units to correspond to specific pipeline construction techniques and are shown on the construction alignment sheets. A soil evaluation is prepared to facilitate development of the most economical and efficient construction procedures which ensure the maintenance of land capabilities.

Soils handling and reclamation procedures specified in the Environmental Protection Plan should be based on the soil evaluation.

5. Impact Evaluation and Mitigation

This section of the application should evaluate the potential impacts associated with the construction, operation, and abandonment of the pipeline and the ancillary facilities.

The potential environmental impacts of the pipeline project should be outlined and the general mitigation measures described.

The impact evaluation includes the effects of the pipeline itself, and of associated facilities such as camps, access roads, and powerlines. The impact evaluation is comprehensive; it complements the environmental overview. A "Checklist of General Pipeline Construction Concerns and Mitigative Measures" is available from Alberta Environment, Land Reclamation Division.

6. Environmental Protection Plan

The purpose of the Environmental Protection Plan is to show clearly the measures planned to minimize adverse impacts. The Environmental Protection Plan documents all areas subject to potentially adverse impacts along the pipeline route, and provides a detailed description of the construction techniques that will be used to mitigate those impacts during and after construction. The site-specific information is essential to the Development and Reclamation application.

The Environmental Protection Plan consists of two parts: a Specifications Book that describes in detail the protection measures that are to be implemented, and Reference Maps that show the sites at which specified measures are to be undertaken.

Environmental Protection Plan formats and methods for implementation can be obtained from Alberta Environment, Land Reclamation Division.

Proponents should indicate all environmental protection measures on the alignment sheets or on other appropriate plans to ensure that the contractor is aware of the measures to be implemented. Environmental protection measures include such items as:

a) Areas where extra working space and additional clearing are required.

b) Prevention of damage to adjacent trees during clearing and avoidance of spoil placement in treed areas. Salvage of merchantable timber and disposition of slash by burning, rollback or other acceptable methods.

c) Methods of stripping, trenching, grading and soils handling to separate and store topsoil and root zone material.

d) Methods of backfilling to restore the soil profile.

e) Cultivation, conditioning and seeding of the right-of-way following construction.

f) Measures to control stream sedimentation at pipeline and vehicle stream crossings.

g) Reclamation procedures to be followed at stream, road and foreign line crossings.

h) Scheduling of construction to avoid periods when wildlife are most sensitive to disturbances in areas of critical habitat.

i) Measures to minimize short term impacts on wildlife by maintaining breaks in snow and brush windrows, set-up pipe and open trench.

j) Long term wildlife protection measures to control access, reduce line of sight, and provide revegetation for food and cover.

k) Special measures to protect drainage systems, irrigation systems, shelterbelts, etc.

The handbook User should also refer to Section 6.0 on pipeline construction procedures.

8.4.1.2 Sand and Gravel

In 1982, Alberta Environment initiated a Sand and Gravel Program, to ensure gravel pits will be reclaimed to an acceptable land capability. This can be achieved using conventional gravel mining methods and machinery, if proper planning is implemented.

In the past, the mining of gravel resources has resulted in severely scarred landscapes. Although some reclamation of gravel pits has taken place in the province, the majority of the estimated 66 sections, or 42000 acres, of disturbed agricultural land have been left as barren open pits.

The Sand, Gravel, Clay and Marl Surface Operations Regulations (AR 228/82) came into effect in 1982, pursuant to the Land Surface Conservation and Reclamation Act. These regulations require pit operators to obtain a Development and Reclamation (D & R) approval for pit operations. Pursuant to the legislation, it is now the responsibility of the landowner or the holder of an exclusive gravel lease to ensure gravel pits are reclaimed to the Land Conservation and Reclamation Council's minimum reclamation requirements (see above).

This section will assist the proponent by providing instructions for the collection of information needed to complete an application for Development and Reclamation approval. In addition, the handbook User should obtain and review a document entitled "Sand and Gravel Manual, How to Apply for a Development and Reclamation Approval." This document is available from Alberta Environment, Land Reclamation Division. Much of the information within this section has been obtained from this document.

D & R approvals are required for all "large pit developments" on **private land** in Alberta, pursuant to the Sand, Gravel, Clay and Marl, Surface Operations Regulations (AR 228/82) (see Appendix A1).

A "large pit development" is defined as:

1. any plant for processing sand, gravel, clay, or marl, settling ponds, storage facilities, overburden storage, or disposal sites that exist or are to be developed in connection with the pit
2. any connected access or haul road, railway, telecommunication line, or pipeline incidental to the pit
3. the opening up, operation, or abandonment of a pit for the purpose of removing sand, gravel, clay or marl, that in total disturbs or will disturb 5 acres or more of land in a given parcel.

The landowner or the holder of a written exclusive right (lease) to remove sand, gravel, clay or marl from the parcel of land is required to apply for the D & R approval. A copy of the written lease is required with the application when the operator applies for the D & R approval (royalty agreements may be deleted).

The standards used by Alberta Environment ensure disturbed land is reclaimed to an acceptable land capability which is equivalent to that which existed prior to the pit development. Alberta Environment's guidelines are flexible, allowing for reclamation to a variety of reclaimed uses, keeping in mind a balance between resource development and practical use of the reclaimed site. The minimum standards have been provided at the beginning of Section 8.4.

The responsibility for reclamation is as follows:

1. For a "large pit development" a D & R approval is required. The holder of the D & R approval is responsible for ensuring that reclamation is completed.
2. For a "small pit development" (a pit which will not be greater than 5 acres in size), a D & R approval is not required. However, the landowner is responsible for reclamation under Part 3 of the Land Surface Conservation and Reclamation Act and the minimum standards identified earlier in Section 8.4 apply.

When a pit is abandoned (ie. when sand and gravel reserves are depleted), reclamation should be completed. Alberta Environment recommends progressive reclamation whenever feasible. Progressive reclamation will reduce reclamation costs substantially. When reclamation is completed to the Land Conservation and Reclamation Council's requirements, the holder of the D & R approval should request a Reclamation Certificate from the Chairman of the Land Conservation and Reclamation Council. The Reclamation Certificate is a certification by the Land Conservation and Reclamation Council acknowledging that pit reclamation has been completed.

When the Reclamation Certificate is obtained, responsibility for reclamation ends. The Reclamation Certificate applies to both "large" and "small" pits.

A security deposit will be required pursuant to the Security Deposit Ministerial Regulations (AR 242/82). The security deposit is based on $250 per acre of land to be disturbed and must be submitted within 60 days from the date the D & R approval has been issued.

Regular site inspections will be made by the Reclamation Officer to identify any concerns and to ensure the operator complies with the conditions of the D & R approval or the minimum reclamation requirements.

The reclamation plan should cover the minimum requirements as discussed at the beginning of Section 8.4 and the following details should be considered for "large" and "small" pit operations:

1. Conservation of topsoil and overburden materials:

   The conservation and replacement of topsoil and overburden materials is essential for reclamation. Topsoil and overburden must be salvaged separately, stockpiled in a safe and accessible location, and replaced in the proper sequence over the recontoured pit area. Topsoil is to be salvaged from all overburden and aggregate stockpile sites. Where present, brush and trees should be removed and burnt, or stored for rollback prior to salvage of topsoil and overburden materials. All topsoil and overburden stockpiles should be seeded to prevent erosion and weed growth.

2. Maintenance of undisturbed buffer zones:

   Undisturbed buffer zones are required to protect adjacent land and permanent structures against adverse effects from the mining activities. The buffer zones are located adjacent to property boundaries, road allowances, permanent structures, watercourses and water bodies.

   a) The normal buffer zone for property boundaries, road allowances, and permanent structures is 3 metres (10 feet) or a distance equal to the total depth of the pit, whichever is greatest.

   b) For watercourses and water bodies, a 30 metre (100 feet) or 60 metre (200 feet) buffer may be required depending on the stability of the bank or shoreline. Questions regarding buffer zone requirements may be directed to the Supervisor, Sand and Gravel Section, Regulated Operations Branch, Alberta Environment.

3. Control of erosion and surface drainage

   The operator must control erosion of topsoil and overburden stockpiles, and ensure that surface drainage does not enter adjacent land, unless otherwise authorized by the Water Resources Administration Division of Alberta Environment.

   Erosion and drainage control is required to eliminate problems that may affect adjacent land or make reclamation more difficult. Drainage controls within the pit must be acceptable to the Reclamation Officer. Existing problems must be corrected to the satisfaction of the Reclamation Officer and the Water Resources Administration Division.

4. Reclaimed slopes:

   Pit slopes are to be reclaimed to a maximum 4:1 (horizontal to vertical) slope along the pit perimeter which allows acceptable access of the reclaimed pit area following reclamation. Active pit walls should be reduced to 2:1 slopes when mining activities are temporarily stopped.

5. Additional reclamation guidelines:

   For more complex pit operations, additional reclamation guidelines may be applied where extraordinary site conditions create special concerns. Examples of complex pit operations include pits which are:

   a) located on better quality agricultural land
   b) located along valley breaks
   c) located along major watercourses
   d) which will be mined below the water table.

   The additional reclamation guidelines relate to ensuring reclaimed land capability on agricultural land, ensure slope stability along valley breaks and watercourses, ensure stability of the reclaimed land where groundwater is encountered, and ensure land-use conflicts are resolved.

   The identification of reclamation concerns, determining guidelines and their incorporation into the planning stage of the development will greatly reduce reclamation costs.

   Where a watercourse or the water table is encountered, additional authorizations under the Water Resources Act and Clean Water Act may be required.

   The proponent should contact the Supervisor of the Sand and Gravel Section of the Regulated Operations Branch, or the Reclamation Officer (see Appendix C) to discuss if any additional reclamation guidelines will apply to the pit operation.

For the D & R approval on "large pit" operations, the following information is required to complete the application:

1. A completed application form, signed and dated, and with corporate seal affixed if the applicant is incorporated.
2. Detailed development and reclamation drawings including drawings which show:
   a) existing site conditions and development sequence
   b) two sets of cross-section drawings.
3. A written description of the mining operation explaining:
   a) the pit activities which are to be conducted during gravel mining (e.g. crushing, washing, settling pond construction, dewatering)
   b) the method in which topsoil and overburden materials are to be salvaged during mining and reclamation. Stockpile site locations must be shown in the D & R plans.
   c) The timing, method and location where the overburden and topsoil materials are to be replaced during and after mining of the resource. The depth of the materials must be identified. Areas to be mined and sequence of reclamation during the operation must be shown on existing plans. Progressive reclamation is recommended.
   d) The method in which surface water, groundwater and off-site drainage are to be controlled.

4. A copy of the lease agreement or written verification from the landowner authorizing the operator to mine the sand, gravel, or clay resources.
5. A pair of aerial photographs for stereoscope use.
6. A copy of the Farm Land Assessment Record for the pit area.

Additional information may be required for complex pit operations. This information may include:

1. additional drawings showing mining and reclamation sequence, location of existing and potential water bodies
2. additional cross-sections for large or complex pit operations
3. assessment of material quality for reclamation and material handling description for operations on good quality agricultural land.

Additional information will only be required when there is insufficient knowledge available to identify and resolve reclamation and land-use concerns for a particular site.

8.4.1.3 In Situ Oil Projects

For in situ oil projects, the handbook User should refer to a document entitled "Development and Reclamation Applications for In Situ Schemes". This document will be available in 1988 from the Development and Reclamation Review Committee of Alberta Environment.

The requirements for a D & R plan vary for the size and the type of the project. The proponent must contact the Land Reclamation Division of Alberta Environment to discuss the requirements of each specific D & R program.

For in situ schemes an application has to be made to the ERCB (see Section 7). The application includes an environmental component. The environmental component varies based on the size and type of project.

Details of the environmental component, in particular the Environmental Impact Assessment (EIA) requirements, are outlined in section 7.2.1. Under the EIA, a conceptual D & R plan is required. This section outlines the requirements of the detailed D & R submission.

A D & R plan can be submitted with the initial ERCB application. If the scheme remains unchanged during the ERCB approval process, the D & R approval may be issued concurrent with the ERCB approval. If, however, the scheme changes, the D & R application may have to be modified or resubmitted before an approval may be granted.

For large projects, the D & R plan is reviewed by the D & R Review Committee. For small projects or experimental schemes, the process is the same but only a select group from the committee review the submission.

The detailed D & R submission is an application for specific operations approval related to land surface disturbance, land conservation and land reclamation. It presents an operational plan that is problem oriented, focusing on important issues and dealing little with minor or insignificant concerns.

For experimental in situ projects, Table 8.4.2. outlines the contents of the much smaller D & R application.

For commercial projects three major components make up the D & R submission:

1. Conceptual Development and Reclamation Plan
2. Pre-Development Site Analysis
3. Detailed Development and Reclamation Plan.

1. The Conceptual Development and Reclamation Plan

   As discussed in Section 7, when the environmental component of the ERCB application is submitted a conceptual development and reclamation plan is prepared. Once the ERCB approval is obtained, it is necessary to update the conceptual plan. The update must highlight major changes since the original conceptual plan was developed.

   The contents of a conceptual plan are detailed in Section 7 and include the following components:

   a) Overview of the development

b) Life-of-scheme development plan
    (i) Drilling and surface infrastructure
    (ii) Central plant site and facilities
    (iii) Water management
    (iv) Waste management
c) Life-of-scheme reclamation plan
    (i) Conceptual plan
    (ii) Restoration of capability
d) Development and reclamation issues
    (i) Biophysical and recovery scheme issues
    (ii) Public participation

2. Pre-Development Site Analysis

The pre-development site analysis includes two major components. The biophysical inventory section describes the biological and physical characteristics of the site. The land capability section provides an evaluation of land capabilities prior to development which will be used in part to judge the success of reclamation.

The pre-development site analysis addresses the same environmental categories as the Biophysical Impact Assessment portion of the EIA (see Section 7). These include:

a) biophysical inventory
    i) climate
    ii) topography and erosion potential
    iii) soils and overburden soils, overburden (surface and bedrock geology)
    iv) water resources, surface water, hydrogeology
    v) vegetation
    vi) fish and wildlife (habitat and resources)
    vii) special or unique features
    viii) pre-development land use
b) pre-development land capability
    i) soil capability for agriculture (where applicable)
    ii) soil capability for non-agricultural areas (only where applicable)
    iii) wildlife capabilities
    iv) recreation capability

The content and level of detail will depend on the nature, size, and complexity of the scheme and how and when the proponent chooses to submit the Development and Reclamation plan. The timing options available include:

a) plan submitted after ERCB approval process
b) plan submitted during ERCB approval process
    (i) conceptual plan only
    (ii) complete plan.

a) Development and Reclamation plan submitted after ERCB approval process

If the Development and Reclamation application is submitted after the ERCB approval process, the development site analysis should be a separate part of the Development and Reclamation application. The purpose is to provide additional detail, where necessary, on matters directly relating to surface disturbance and land reclamation. As previously noted, the content and level of detail should suit the size and complexity of the scheme.

When the information in the ERCB application is appropriate, it may be referenced or briefly summarized. Applicants should recognize that the level of detail provided in the EIA (as part of the application) was only in support of a conceptual development and reclamation plan, whereas the application for Development and Reclamation approval requires inventory data at a more detailed level to support an operational plan for a specified time period or development sequence.

b) Development and Reclamation plan submitted during ERCB approval process

(i) conceptual plan (only) submitted

An applicant may choose to only submit a conceptual plan in the ERCB application and leave the detailed operational plan for a later date. Preparation of conceptual plans requires understanding of pre-development site conditions; however, these areas are discussed in the Biophysical Impact Assessment portion of the EIA and do not require repetition in the conceptual D & R plan portion of the ERCB application.

(ii) complete Development and Reclamation plan submitted

When a complete Development and Reclamation plan is submitted with the ERCB application, the information presented elsewhere in the application on pre-development site analysis may be referenced or briefly summarized. However, applicants must recognize that when this is done, the level of detail must support the operational plan presented in the Development and Reclamation application.

3. Detailed Development And Reclamation Plan

This section should provide the detailed plans for development and reclamation activities for either a specified time period of operation (typically five years) or a specific sequence of operations, whichever is applicable. The plan should be consistent with the EIA and the ERCB licence applications and should detail the procedures that will be used to ensure satisfactory reclamation.

The components of the plan include:

a) Background
  (i) upgraded pre-development site analysis
  (ii) upgraded conceptual Development and Reclamation plan

b) Development Plan
  (i) drilling and surface infrastructure
  (ii) central plant site and facilities
  (iii) water management
    - drainage control
    - water reuse
    - water disposal
  (iv) soil salvage plan
  (v) timber salvage plan (only where applicable)
  (vi) land ownership
  (vii) waste management

c) Reclamation Plan
  (i) general
  (ii) topography
  (iii) soil conservation
  (iv) re-establishment of surface water resources
  (v) revegetation plan.

To explain these components further, the following should be noted:

a) Background

This section need only be provided when the Development and Reclamation application is submitted after the ERCB approval process (i.e. when only a conceptual plan was provided in the ERCB application).

(i) upgraded pre-development site analysis

The level of detail of information provided in the EIA portion of ERCB application was in support of a conceptual development and reclamation plan, whereas the formal application for Development and Reclamation approval requires data at a more detailed level to support an operational plan. This section should follow the format outlined in item 2 above (pre-development site analysis). Therefore, the purpose of this section is to provide additional detail, where necessary, on pre-development site conditions that directly relate to surface disturbance and land reclamation.

(ii) upgraded conceptual Development and Reclamation plan

This section should update the conceptual Development and Reclamation plan presented in the EIA, and should provide additional detail, where necessary, on matters directly relating to surface disturbance and land reclamation.

b) Development Plan

(i) drilling and surface infrastructure

Provide a summary description of the drilling program (including handling and disposition of drilling wastes) and the general infrastructure development scenario, including general construction methods, construction sequence, and schedule. Provide an aerial plan illustrating the extent and nature of surface disturbances created by the development, including drilling and process waste storage/disposal sites, field production facilities (well pads, satellites), roads, power lines, pipelines, borrow areas, and other facilities associated with development.

(ii) central plant site and facilities

Provide a plantsite development plan showing the location of facilities in relation to topography and drainage.

(iii) water management

- drainage control

  Provide a surface water management plan illustrating drainage control from on-site and off-site areas, and the location of drainage control structures. Provide plans indicating any modifications to existing drainage systems, including ditches, ponds, diversions. Identify disturbances related to water management that would require additional reclamation activity.(See Section 8.7.7.3.)

- water reuse

  Provide water quality information and alternatives for water reuse. Provide plans for water reuse.

- water disposal

  Discuss the types and volumes of all production and other wastes generated at the central plant site and field facilities, (e.g. sandy oil wastes, drilling fluids, lime sludge, etc.), including details of the proposed disposal methods. In addition, identify the types of waste disposal facilities available.

(iv) soil salvage plan

Provide a description and plan illustrating the topsoil and subsoil salvage program based on the information on soils and overburden. The plan should address the recoverable depths and volumes of topsoil and subsoil materials, the location, size, and duration of any stockpile sites, and interim erosion control measures.

(v) timber salvage plan (where applicable)
Provide a timber salvage plan according to the methods specified in "The Alberta Forest Service Requirements for the Assessment of Forest Land Disturbances," Alberta Energy and Natural Resources, 1982. Include the contract specifications, the quantity, sequence, and schedule, and overlay of the salvage areas on the forest inventory map.

(vi) land ownership
Provide names of the owner(s) or trustee of the land to be developed.

c) Reclamation Plan

(i) general
Discuss general reclamation principles and approach, the sequence of development, abandonment and reclamation of field production areas, and erosion control ("interim" reclamation) of peripheral disturbances (roadsides/cuts, power line/pipeline ROW's, borrow areas, etc.).

(ii) topography
Describe recontouring activities relative to specific disturbances. Illustrate how the reclaimed areas will provide for erosion control and planned surface drainage, and how they will integrate with adjacent drainage systems.

(iii) soil conservation
Provide a description and plan illustrating the depths and quality of soil materials to be replaced on the recontoured areas. The description should include a discussion of the anticipated physical and chemical characteristics of the replaced soil, any interim management techniques that may be required to achieve the desired post-development capability, a soils material balance relating materials available and materials required, and the method to be used to isolate problem materials that may affect the capability of the replaced soil.

(iv) re-establishment of surface water resources
Provide a description and plan illustrating the details of any water systems which will be re-established, including long-term management and maintenanace requirements.

(v) revegetation plan
Provide a description and plan illustrating the interim and permanent vegetation to be established on the recontoured areas within the specific time period (e.g. five years) or development sequence, including for each: a species list, the seed application rates and methods, the stocking rate, size, quality and source of tree and shrub stock, and the timing, rate and strategy of fertilization.

(vi) waste management plan
Identify method to dispose of wastes (on-site and off-site).

Table 8.4.2.

Development and Reclamation Application for Experimental In Situ Oil Sands Scheme

An application for Development and Reclamation Approval of an experimental in situ oil sands scheme should contain the following information:

Information	Description
1. Soils Handling	• A soil profile (typical) for the disturbed areas shall be submitted to the depth of disturbance. This information may be obtained from existing soil survey reports or from field investigations or both as required.
2. Surface Disturbance Plans	• All areas to be disturbed should be shown on a topographic map of the site using contour intervals appropriate to the location. The plan should also show the location of soil materials to be conserved for final reclamation.
3. Surface Drainage Plans	• A plan showing drainage control on and off the site and the location of ditches, ponds, diversions, and stream crossings.
4. Waste Disposal	• A summary of all production and other wastes generated is required including the method of disposal.
5. Vegetation Plan	• A vegetation management plan for the use and maintenance of vegetation.
6. Final Reclamation Plan	• The plan should provide for: a) the removal of infrastructure b) the restoration of natural watercourses c) the replacement of soils d) revegetation and conditioning of the site.
7. Environmental Monitoring Programs	• The applicant should submit a summary of all environmental monitoring programs which will be carried out in conjunction with the project.

8.4.2 RECLAMATION IN FORESTED AND NON-FORESTED AREAS

8.4.2.1 Reclamation of Forested Areas

Whenever land is cleared by a linear or lease development, debris disposal is a major concern. This section outlines the requirements and gives some ideas for debris disposal in Alberta.

1. Debris Disposal

   Debris disposal is the total or partial disposal of all unsaleable timber, brush, roots and other debris on the right-of-way. It is done to reduce fire hazard and improve aesthetics. Total disposal is the complete removal and disposal of debris by burning and/or limited burying (unburned material). Partial disposal is the mechanical or manual cutting of accumulated slash and debris. Debris is usually left in compact windrows or spread over exposed areas and crushed by heavy machinery.

   Goals for debris disposal include:

   a) speed up decomposition of debris
   b) assist in controlling the spread of forest fires
   c) reduce visual impact of clearing
   d) control erosion on slopes by spreading and crushing debris over disturbed areas.

   In Alberta, the Forest and Prairie Protection Regulations divide the Province into two areas for debris disposal. The "Relaxed Area" is north of the Imaginary Line (described in the Regulations); the "Partial Disposal Area" is south of this Line (see Figure 8.4.1).

   a) Relaxed Area

      Requirements for disposal in this area are as follows:

      (i) All leaning trees must be felled.
      (ii) Every road and trail used or crossed during the operation must be restored to its original condition.
      (iii) Bucking of debris in the windrow is not specified in the Regulations. However, debris is commonly bucked into approximately 4m lengths to accelerate decomposition and produce cleaner lines, thereby accelerating cleanup approvals and procurement of Reclamation Certificates.

   b) Exceptions Within The Relaxed Area

      Partial or total disposal may be required for the following:

      (i) All lands within 90m of the centre line of an all-weather road.
      (ii) All lands within 1km of the high water mark of lakes and streams having recreational potential, as specified by the Minister.
      (iii) Any other land exempted by the Minister.
      (iv) All land covered by a timber disposition (e.g. Forest Management Agreement, Timber Quota Area).

   c) Partial Disposal Area

      Similar to the Relaxed Area, with the following additions:

      (i) All damaged trees must be felled.
      (ii) All felled trees must be bucked to 4m or less and all limbs removed.
      (iii) Bucking and subsequent crushing with heavy machinery is acceptable.

Disposal methods common to both areas are:

a) Rollback of debris

"Rollback" is the practice of spreading debris from clearing back over the line after program completion. It is restricted to debris less than 15cm in diameter and the debris should be compacted. Rollback for fish and wildlife requirements is that amount required to control access, generally 200m from existing access points.

The advantages and disadvantages are as follows:

(i) Advantages:

- It breaks up the slash windrow and spreads debris closer to the ground for quicker decomposition.
- It is an excellent method of controlling erosion on steep slopes or other areas of high erosion potential.
- It restricts access into critical wildlife areas as specified by Fish and Wildlife staff.
- It promotes revegetation by providing microsites for seeds.

(ii) Disadvantages:

- It makes re-use of the line very difficult as the debris must be removed. This can be extremely difficult if the debris is frozen into the ground.
- It creates conflicts with other land users because it restricts their access into the area.

The use of rollback should be discussed with the local Forest Officer (see Appendix C) *before* finalizing any application.

b) Total disposal

Total disposal, applicable in both the Relaxed and Partial Disposal areas, reduces the visual impact of pipelines, seismic lines and other land disturbances. Whenever a linear disturbance crosses an all-weather road, total disposal should be completed for a distance of 90m from either side of the road's centre line. In some instances, this distance has been reduced to line-of-sight when the seismic line has been properly dog-legged prior to crossing the road.

In areas experiencing spruce bark beetle infestation problems, total disposal may be required for all trees over 20cm in diameter.

The most common method of total disposal is burning, with the residue hauled down the line and spread out of sight in the residual trees. Fire permits are required in Alberta between April 1 and October 31. Burial of debris is discouraged because:

(i) Slumping usually results as buried materials decay.

(ii) Anaerobic decay of buried organic material can produce noxious odors which may be toxic to humans and wildlife.

(iii) Seismic lines are sometimes used for pipeline rights-of-way or roads, and buried debris can present problems.

Burial of burnt residue or stumps may be approved if the material is covered by a minimum of 1m of mineral soil.

When discussing debris disposal, the handbook User should be aware of the following requirements as they relate to activities in this handbook:

a) Seismic lines

The requirements for seismic line debris disposal within Alberta are covered under the Forest and Prairie Protection Act and Regulations.

b) Access roads and lease sites

(i) winter/temporary roads

These roads can be described as any petroleum roadway providing temporary access during dry or frozen periods for exploration drilling and used for two years or less.

Partial disposal, as listed below, is the usual requirement for temporary access; however, total disposal may be required in agricultural areas if access is more than 8m wide. The following should be observed:

- All disturbed trees must be felled.
- All felled trees must be bucked and limbs removed.
- Bucking and subsequent crushing with heavy machinery is acceptable.

(ii) Permanent Roads

These are described as petroleum all-weather roads used year-round to access field and facilities for 2 years or more.

Total disposal of all debris is required, using the following methods:

- Burning – all debris is placed in piles or windrows no longer than 60m. Windrows must be a minimum of 8m apart. Windrows must be a minimum of 15m from standing material.
- Smaller debris can sometimes be rolled back and crushed on exposed areas for erosion control, however, as discussed earlier, this practice must be approved by the local Forest Officer or Public Lands Officer (see Appendix C).
- Burial of debris is discouraged.

c) Pipelines

All pipelines with rights-of-way greater than 8m require total disposal. Pipelines less than 8m require partial disposal.

2. Erosion Control

To prevent serious erosion and sedimentation from occurring on newly constructed areas, soil exposure must be minimized and surface runoff must be controlled. Although erosion can be caused by many factors, water erosion is the chief agent of damage. Section 8.5 addresses all aspects of erosion and erosion prevention.

3. Revegetation in Forested Areas

Establishing a self-sustaining, erosion-controlling vegetative cover is essential if the ultimate goal of reclamation is to be achieved: to restore the disturbed area to a productive capability similar to or better than the predisturbed condition. Species recommendations are given in Section 8.4.4.

In order to determine the optimum revegetation plan, the following factors are to be considered:

a) Species selected must be consistent with the planned use of the area (eg. commercial forest, recreation area, grazing area or wildlife habitat).

b) Climate, soil conditions, steepness of slope and other physical and chemical parameters must be closely examined when selecting a seed mix.

c) Erosion control is of utmost importance, therefore a seed mixture must be fast growing, self-sustaining, require little or no maintenance and create limited fire hazard.

d) Vegetation management is also an important concern, particularly for pipeline and access rights-of-way where extensive high growth is undesirable. Weed control and other future maintenance must be considered (see Section 8.11).

Every disturbed site has different requirements. In order to determine the most suitable revegetation program it is suggested that the operator:

a) observe previous successful efforts in the area for similar sites

b) obtain professional or technical advice from individuals familiar with the area

c) obtain soil analyses to determine suitable seed and fertilizer requirements.

4. Reclamation for Abandonment – Forested Areas

When a particular activity is abandoned the following must be undertaken:

a) Seismic Lines

(i) Install cross-ditches on steep slopes to divert runoff onto adjacent vegetated areas.

(ii) Provide proper breaks in berms created during construction on downhill side of line to ensure adequate drainage.

(iii) All temporary watercourse crossings must be removed prior to spring breakup (e.g. snowfills and logs that have been cabled together).

(iv) Seed disturbed areas with an acceptable mixture (see Section 8.4.4). Fertilizer should also be applied to ensure quick revegetation.

b) Road abandonment

A road may be temporarily abandoned because of capped or shut-in wells required for future production. As a result the following are required:

(i) Remove all watercourse crossings such as bridges and culverts.

(ii) Maintain grade but install cross-ditches and other erosion measures as required.

(iii) Revegetate all exposed areas.

(iv) Entry onto the road must be blocked if located in wildlife or ecologically sensitive areas.

(v) An active maintenance program should be implemented.

When roads are permanently abandoned the following are required:

Temporary Roads

(i) Recontour cuts and fills to natural contours where slope and materials make this practical.

(ii) Install erosion control measures including cross-ditches or diversion berms as required.

(iii) Roll back windrowed debris for erosion control and provide microsites for vegetation. Rollback on patented lands is usually not permitted. Total disposal is required.

(iv) Remove all watercourse crossings and stabilize creek banks if necessary.

(v) Revegetate disturbed areas using a suitable seed mix and fertilizer (see Section 8.4.4).

Permanent Roads

(i) Remove all watercourse crossings and stabilize creek banks where necessary.

(ii) Recontour cuts and fills as close to natural contours as possible.

(iii) Scarify the road surface.

(iv) Install erosion control devices as required.

(v) Spread surface strippings (duff layer) over exposed areas. Spread debris over disturbed areas and crush mechanically.

(vi) Seed and fertilize the right-of-way with suitable mixtures.

8.4.2.2 Reclamation of Non-Forested Areas

In non-forested areas, soil preservation is an important issue. The following guidelines should be followed:

1. Topsoil Conservation

Topsoil/subsoil mixing may contribute to reduced soil capability, and can occur during grading, trenching, backfill or cleanup operations of a construction project. Mixing is avoided by specifying construction techniques appropriate to the field conditions, and following through with adequate inspection.

It is necessary to strip and conserve topsoil on arable and pasture lands. The width of topsoil stripped can vary from the ditch width to the entire right-of-way, depending upon landowner wishes, types of equipment used (ditcher (ditchline only), bulldozer or grader (width of blade or more), and soil conditions. The depth of topsoil to be stripped varies from region to region. From a practical standpoint, when topsoil depth is less than 8cm it is very difficult to separate from subsoil. For further information about the importance of conserving topsoil refer to Section 6.

When stripping topsoil, it is very important to ensure that the topsoil and subsoil piles do not overlap but are kept separate. This can be particularly important at river crossings, road crossings and railway crossings or other areas where considerable subsoil may be excavated. In some cases, additional right-of-way may be necessary to keep the topsoil separated from the subsoil.

2. Soil Compaction

The weight of heavy equipment can compact soils so that air spaces in the soil and the ability of the soil to absorb and retain water are all reduced. Heavy soils (those with a high clay content) are most susceptible to compaction. Compacted soils frequently result in surface ponding and/or a reduction in productive capability.

Compacted soils can theoretically be restored naturally by repetitive freezing and thawing, activities of soil organisms and incorporation of organic litter into the soil. However, these natural processes may act very slowly and vegetation must be re-established on disturbed sites as soon as possible. The top few centimetres of soil are usually those most seriously compacted, although heavy equipment on wet clay soils can result in impact to considerable depth. Where the topography is reasonably level and the soil is not too stoney, disking and/or harrowing with agricultural equipment can be used to loosen compacted soil. The use of tracked, as opposed to wheeled, vehicles may also minimize compaction. Where heavy equipment has been used on clay soils, the right-of-way should be checked to determine where or if deep cultivation is required.

3. Erosion Control and Revegetation

The factors which influence erosion potential are climate, soil properties, length and steepness of slope and the presence or absence of vegetation. These factors are the same in non-forested areas as in forested areas. Special precautions are necessary to protect topsoil during and following construction.

A major difference between forested and non-forested areas is that the majority of non-forested land is privately owned. Therefore, a third party becomes involved in decisions regarding appropriate reclamation techniques. On cropland and rangeland the owner should be consulted before decisions on erosion control and revegetation are made.

Because most cropland is reasonably level, the non-vegetative erosion control methods described in Section 8.5 are seldom necessary, except perhaps on the slopes of a stream crossing and at road crossings. Considerable care must be taken, however, in the selection of seed and plant species. This is true for both cropland and rangeland. Farmers and ranchers are very concerned about the introduction of weeds or other undesirable plants onto their property. Some farmers will prefer that disturbed cropland not be revegetated, but reseeded to crops during their normal planting operations. Others may prefer a particular cover crop on the right-of-way as a temporary vegetative cover. In either instance, it is common industry practice to hire farmers to revegetate the portions of the land that have been disturbed. They not only have the equipment available to prepare the surface and plant the seeds when conditions are suitable, but they have a strong interest in seeing that the job is done properly. It should be noted, however, that regardless of who is hired to do the work, the proponent is ultimately responsible for reclamation.

The revegetation of rangelands is more difficult than cropland because they are usually characterized by thinner topsoils, rougher topography and generally poorer growing conditions. Also, because much rangeland is in arid areas and new growth will be quickly grazed by cattle, revegetating rangeland can sometimes be very difficult. In such conditions, surface disturbance must be minimized and reclamation efforts must be carefully planned, closely supervised and monitored. On the most severe sites, it may take several years to obtain a good vegetative cover. It is frequently necessary to exclude livestock from these sites until new vegetation is well established.

8.4.3 SPILLS AND CLEANUP

When considering spills and cleanup the following should be addressed:

1. oil and saltwater spills
2. elemental sulphur
3. facility site remediation
4. chemical spills.

Reclamation for item 2 is addressed in Section 5.3.8, Sulphur Handling. Item 3 is addressed in Section 8.10, Decommissioning. Item 4 is addressed in Section 5.3.7, Waste Handling.

8.4.3.1 Oil and Saltwater Spills

If an oil or saltwater spill occurs, the following initial steps should be undertaken:

1. Notify the regional office of the ERCB immediately if the spill is off lease or exceeds 2m^3 (see Appendix C and Figure 2.9).
2. Wildlife and livestock should be restricted from accessing the spill affected areas. If required, fences should be erected.
3. All ignition sources should be removed.
4. Keep the spill contained from water sources.
5. Notify the landowner immediately. The landowner should be advised of the occurrence and his consent to enter the property should be confirmed. If the landowner cannot be contacted the proponent should proceed to contain the spill and repair the leak. The landowner should be contacted at the earliest possible time.
6. Document the spill by preparing a plan with dimensions showing the spill location. Also note the type of spill (e.g. oil, saltwater, condensate), area of surface damage and location, cause of spill, spill correction procedure, reclamation procedure, etc.
7. Minimize travel across any crops.
8. Collect all free product and allow spill to be collected in a "bell hole" (earth sump) or collection trench and then remove with vacuum truck. Salvage all topsoil and store separately during excavations. In the winter it may be easier to allow oil spills to solidify for cleanup.

Restoration and revegetation of the spill area can be undertaken as follows:

1. For oil spills (blend, crude and condensate):
    a) Try to restructure the soil by adding fiber. This is accomplished by adding approximately 50mm of fibrous material to the soil (by manure spreader or by hand) and working it into the top 150mm using a rototiller or discer. This helps to aerate the soil and allows better water absorption.

       If the spill occurs in winter, add the material immediately, but wait until breakup to till.

       A list of acceptable fibrous materials follows, in order of preference.

        i) farmyard manure
        ii) feedlot manure
        iii) peat
        iv) wood shavings

        v) chopped straw or hay
        vi) sawdust
        vii) whole straw or hay

    b) Add fertilizer to the soil. Fertilizer formulation will vary depending on site conditions. The recommended dosage is 200kg of nitrogen per hectare.
    c) Arrange to have the spill cultivated once per month for the first growing season.

2. For combined oil and saltwater spills

   Follow the same procedure as for "Oil Spills" with the following change:

    a) After adding fiber to the spill, apply gypsum at a rate of 120kg per 100 square meters or the equivalent in the form of calcium nitrate. This prevents major salt damage to well drained soils, and allows the salt to leach down to groundwater. In the winter the fiber and gypsum may be applied on top of the snow and tilled after breakup.

3. For saltwater spills
    a) A saltwater spill should be attended to immediately. The longer it is left (e.g. days) the longer it takes to restore the spill area (e.g. years).
    b) Apply gypsum to the surface of the spill at a rate of 240kg per 100 square meters or the equivalent in the form of calcium nitrate. This can be accomplished by hand shovel for small spills or a manure spreader for larger spills. In the winter, spread it on top of the snow. A more accurate assessment of calcium requirement should be determined from soil analyses.
    c) Apply approximately 25mm or 50mm of fibrous material on the surface (see item 1 above for suggested fibrous materials).
    d) Cultivate or till the surface to a depth of 50 to 80mm.
    e) If possible, flush the contaminated area using a fine spray of fresh water and collect the fluid from a bell hole using a vacuum truck.

It should be noted that one should not attempt to flush a salt spill before applying gypsum. This will cause more severe salt damage.

When flushing a salt spill with water, the water should neither puddle nor flow on the surface. Runoff will cause unnecessary erosion.

8.4.4 REVEGETATION

8.4.4.1 Soil Amendments

During the construction of linear developments, topsoil should not be mixed with subsoils. The result of mixing subsoils into the topsoil is almost always a less productive soil with poorer texture and structure than the formerly existing topsoil. The degree of impoverishment is directly related to the proportion and quality of the subsoil mixed with the topsoil.

Remedial measures for improving degraded topsoil include the addition of a variety of materials, each of which can help alleviate one or more problems. Soil scientists or agricultural experts should be consulted and topsoil should be tested before decisions are made as to which materials should be added, at what rates, at what times and using what equipment. Some common additives are:

1. Weed-free straw

   This will improve soil drainage and moisture holding capacity. Advantages include availability and erosion control potential.

2. Lime

   Lime is added to raise soil pH to a level equal to or greater than that occuring on undisturbed areas, thus creating better growing conditions.

3. Manure

Manure is an excellent additive. It provides organic matter that is rich in essential plant nutrients, thereby improving soil texture, structure, permeability, moisture-holding capacity and fertility. As manure may contain seeds of undesirable species, it should be used with care on agricultural soils and local manures are preferred. Steam sterilization will reduce this risk.

4. Fertilizers

It is common practice to apply fertilizers prior to or during the seeding of disturbed areas. The objective is to provide sufficient nutrient concentrations in the topsoil. The nutrients most commonly lacking in soils are nitrogen, phosphorus and sulphur. In order to determine if a soil is deficient in one or more of these nutrients, and consequently what type of fertilizer is required, it may be necessary to have soil samples analyzed in a lab. There is no standard prescription for applying fertilizers. The local Forest Service can provide general fertilizer requirements for forested regions. Fertilization recommendations for agricultural lands can be obtained from soil analyses and from District Agriculturalists, Alberta Agriculture.

8.4.4.2 Seed Application

Once the topsoil of a disturbed site is replaced and reconditioned, it is usally necessary to seed the site to insure a prompt vegetative cover. Natural reseeding and revegetation would occur eventually, but even the best sites could take two to three years to fill in. Some would take considerably longer and significant erosion of the topsoil may occur before natural revegetation is complete. The remainder of this section discusses the selection of the proper seed mix, the sources of seeds, seeding rates, timing of seeding, methods of seed dispersal, seed treatments, and trees and shrubs.

1. Seed Mixes

There are several principles to abide by when selecting a seed mix. At all times and at all locations:

a) Consult with the landowner, leaseholder or appropriate government official to determine their preferences or recommendations.

b) Select species that have proven records of success for the region, soil types and conditions that you must revegetate.

c) Include native species in the seed mix if they are available, or choose species which will allow encroachment by native plants.

Information on species suitability is usually easy to find. In addition to the large amount of information in print, there are many individuals in government and within industry that have considerable reclamation experience and may be able to provide assistance.

The principle of using native species is founded on the desirability of minimizing the introduction or spread of foreign species of plants. Also, it is generally accepted that the species of plants growing in an area are best adapted to the local environment and are most likely to be successfully planted. However, the number of native grasses and other native plants which are grown by seed producers is not great and a variety of introduced species are commonly used.

2. Seed Sources

The most important consideration in obtaining seed is the quality and purity of the seed. The cost of seed is a small part of the total reclamation cost. There are many seed dealers throughout western Canada that can provide high quality seed and seed mixes designed specifically for reclamation.

Whichever species are selected, it is strongly recommended that "certified" seed be used which does not contain noxious weed seeds. Reputable seed dealers will provide a certificate of seed analysis indicating seed purity and the type and quantity of weed seed present. Seed which is 100% pure cannot be purchased. To avoid transporting nuisance weeds into an area, local sources are preferred. For information regarding noxious weeds contact the local Agriculture office.

3. Seeding Rates

Seeding rates are usually expressed in pounds per acre or kilograms per hectare. The amount of seed required is governed by several factors including the species used, time of year seeding is done, the method of application and soil conditions.

General seeding recommendations should not be adopted without some thought as to their appropriateness. The rates recommended in the Resource Handbook (available from AFLW) apply only for broadcast seeding. If the seeds are spread either before or during seedbed preparation, the rate could be reduced. If a seed drill is used, rates could be reduced to 1/2 of those listed. A generalized recommendation is made for the sake of convenience, not because it is equally suitable for the wide range of moisture or soil conditions it mentions. It is likely that modification to the general recommendations will improve success on very wet, very dry, saline or nutrient deficient soils.

The document entitled "The Manual of Plant Species Suitable for Reclamation in Alberta" (available from AFLW) contains tables giving recommended planting rates for grasses, forbes and legumes. Handbook users who refer to these tables should read the attached notes carefully.

4. Timing of Seeding

The best time to seed a reclaimed site is early spring, after the thaw, or in late fall. Soil moisture levels, usually the most important limiting factor, are most favourable for seed germination and seedling survival during the spring and early summer. However, wet soils in the spring may restrict the movement of wheeled vehicles. Applying seeds during the fall or winter (on the snow) is generally less effective, although increases in seeding rates may compensate for a decrease in germination rates. Summer seeding is least desirable because of the lack of adequate moisture, but can still be successful if conducted properly.

5. Methods of Seeding

There are a variety of methods available for seeding. The choice of method is governed mostly by the area involved and the topography, but other factors including availability of equipment and access may be important. All of the methods given will disperse seeds over the disturbed area in a relatively uniform way and can be used successfuly under the right circumstances. The choice of methods should be based upon an economic analysis incorporating the cost of seed, labour and machines, which is then rationalized by the consideration of time limitations and other limiting factors. A brief description of the more common methods is given below. The effectiveness of all three broadcasting methods is enhanced if the seeds are incorporated into the soil using harrows, chains, logs or similar methods.

a) Broadcast Seeding – Hand

This method is most suited to small areas, wet sites or steeper slopes. It is relatively slow, expensive and requires good supervision.

b) Broadcast Seeding – Vehicle

This method incorporates a cyclone seeder, or similar seed dispensing unit, mounted on a wheeled or tracked vehicle. This method is more cost effective that hand seeding when large areas are involved. It can be used in conjunction with hand seeding where vehicular access is difficult.

c) Broadcast Seeding – Helicopter

This method has been used with good success on linear developments where access is a problem. It is particularly good for seeding on the snow early in the spring before the thaw. Athough birds will eat some seed and some is washed away with the melt, especially if it occurs rapidly, most will settle though the snow to the soil surface. One disadvantage, caused by downwash from the blades of the helicopter, is poor distribution of the seed. To ensure adequate coverage for all areas, it is necessary to increase seeding rates by 20 - 30%. Although helicopters are very expensive, a well-organized operation need not be much more expensive on a per hectare basis than more conventional methods.

d) Hydroseeding

This is a form of broadcast seeding in which the seed is mixed with water, mulch, and sometimes fertilizer, to form a slurry which is sprayed over the disturbed site. The advantage of this method is that it combines mulching, seeding and fertilizing into one step, thereby requiring less seed than broadcast seeding, and the mulching material clearly delineates which areas have or have not been seeded. However, good access is a necessity and availability of equipment (contractors) is frequently a problem. If hydroseeding is being considered, the equipment should be contracted for well in advance of its anticipated use. Because it is an expensive operation, this method is usually confined to areas with high visibility and/or harsh growing conditions (e.g. dry slopes).

e) Seed Drill

This method is the most effective but it can only be used on relatively flat terrain with no slash on the ground and a minimum of rock. It is used extensively in agricultural areas (local farmers can often be hired) but much less frequently in forested areas, even when topography and soils are suitable.

6. Seed Treatments

It may be possible to improve the success of revegetation by treating the seeds before planting. In the case of legumes, which are part of most recommended seed mixes, they can be inoculated with Rhizobia bacteria. The bacteria assists the plant in extracting nitrogen from the air. Since nitrogen levels in the soils may be deficient and the bacteria are not present if the legumes species does not already grow in the area, plants from uninoculated seeds will grow slowly.

7. Trees and Shrubs

Little emphasis is given to the use of shrubs and trees for reclamation of linear developments. This is because it is not possible to obtain quick vegetative cover with woody plants. Also, it is generally not desirable to have trees on active pipelines or utility rights-of-way.

Trees and shrubs are sometimes planted as a supplement to grasses on unstable slopes because their root systems penetrate more deeply. This reduces the possibility of losing large sections of the slope by slumping. Willows are frequently planted along reclaimed stream banks to help stabilize the bank, and also to create shade so there is less direct sunlight to warm the water. Trees are sometimes planted across rights-of-way where they cross roads, to create a visual screen and to also reduce or eliminate vehicular access to the right-of-way.

In those circumstances where trees or shrubs are necessary for successful reclamation, there are three approaches to establishing woody plants. The first is to use seeds which are collected on-site or purchased. They can be broadcast or hand-planted, depending on the area involved. The problem with seeding is that woody plants grow slowly and will add little to the reclamation effort for several years.

The second alternative is to use purchased seedlings from a government or private nursery. Establishment is quicker than seeding, although still relatively slow compared to grasses and legumes. Costs are higher and the number of species available are limited. If large quantities will be needed, arrangements may have to be made with the supplier 6 - 12 months in advance. This approach is most appropriate in forested areas where the intent of reclamation is to return the site to forest production. In this case, grasses should not be planted because they will retard or kill the tree seedlings. If in doubt, consult local Forestry Officials.

The third alternative, which is particularly appropriate when a small number of plants are needed or a screening effect is wanted (for example at a road crossing), is to transplant locally occuring trees and shrubs. Careful excavation and replanting of shrubs and small trees can result in “instant” vegetation at road or stream crossings.

Volume II of "The Manual of Plant Species Suitability for Reclamation in Alberta" (available from AFLW) provides detailed information on some of the species most appropriate for various environmental conditions and locations in the Province.

Where abandoned roads or pipelines pass through forest areas that have recently (less than 10 years) been regenerated to produce commercial timber, it may be desirable to plant tree seedlings of the same species. The local Forest Officer should be contacted for recommendations (see Appendix C).

Information available on reclamation includes:

1. **Guidelines For The Reclamation of Land in Alberta**

   Information: This document outlines specific criteria for site reclamation. The Acts and Regulations which pertain to reclamation are also included.

   Available: Land Reclamation Division, Alberta Environment
   phone: (403) 427-4147.
2. **Guidelines For The Reclamation of Linear Disturbances**

   Information: Document outlines reclamation in forested areas and non-forested areas as it relates to roadways, seismic lines and pipelines.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.
3. **Forest Growth and Revegetation Along Seismic Lines**

   Information: Booklet outlines forest growth and tree growth studies in detail along seismic lines.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.
4. **Environmental Handbook for Pipeline Construction**

   Information: Includes sections detailing cleanup and reclamation for pipeline projects.

   Available: Land Reclamation Division, Alberta Environment
   phone: (403) 427-4147.
5. **Habitat Enhancement and the Petroleum Industry**

   Information: Document outlines recent enhancement technology as it relates to vegetation management, drilling, road construction and transmission lines.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.
6. **The Resource Handbook, Operational Guidelines For Industry**

   Information: Document outlines specific guidelines for reclamation for abandonment related to exploration and development.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.
7. **Stream Crossing Guidelines, Operational Guidelines For Industry**

   Information: Includes sections detailing stream restoration techniques and stream crossng abandonment.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.
8. **Reclamation with Native Grasses in Alberta: Field Trial Results**

   Information: Document outlines test results of several species of grasses for reclamation of various lands.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.

9. **Sand and Gravel Manual - How to Apply For a Development and Reclamation Approval**

   Information: Appendix outlines minimum reclamation requirments as set by the Land Conservation and Reclamation Council.

   Available: Land Reclamation Division, Alberta Environment
   phone: (403) 427-4147.

10. **Resource Road Planning Guidelines**

    Information: Document outlines erosion control and revegetation specific to roadway construction.

    Available: Information Centre, AFLW
    phone: (403) 427-3590.

11. **The Manual of Plant Species Suitability for Reclamation in Alberta, Volume I and II**

    Information: Provides planting rates for seeds of various species.

    Available: Information Centre, AFLW
    phone: (403) 427-3590.

8.5 EROSION

Erosion is the process of removal, transport and deposition of soil material from the surface of land by running water, wind, gravity or ice. Associated with erosion is sedimentation, which is the deposition of eroded materials in stream channels.

Sediments entering streams are a major pollutant and have significant effects on the survival, reproduction and growth of fish. Sediments increase the cost of municipal water supply, and reduce the effectiveness of irrigation through clogging of soil pores and siltation of reservoirs and irrigation canals. Excessive sediments could also reduce recreational and watershed quality.

Table 8.5.1 is a quick reference which outlines environmental concerns, the location of information within this handbook, and the regulatory contact for each environmental concern.

8.5.1 TYPES AND EFFECTS OF EROSION

Erosion and sedimentation occur under both natural and man-induced conditions.

Erodability of soil depends on factors such as:

1. soil particle size and type
2. slope of terrain
3. topographic position (climatic effects)
4. surface cover
5. soil moisture.

Activities which disturb the integrity of the topsoil or remove the stabilizing vegetation may accelerate the rate of erosion. This section discusses some of the methods used to eliminate or reduce accelerated erosion.

The factors which affect erosion are:

1. Rainfall: The amount and intensity affect the amount of erosion. In Alberta, depending on the soil type, rainfall of more than 25mm per hour may exceed the infiltration rate of water into soil. It is not unusual to receive 100mm of rainfall in an hour. Under these conditions, serious erosion and disturbance of the topsoil will occur. Rainfall intensities from various weather stations are available from: Environment Canada, Atmospheric Environment Services.
2. Snowfall: Sudden runoff during rapid spring thaws may result in extensive erosion, particularly on sloping ground. Erosion caused by snow meltwater is often aggravated by mud slides which occur because the surface soil layers are saturated with water while the soil underneath is still frozen.
3. Soil Type: As indicated in Table 8.5.2, the texture and physical conditions of soil can affect the amount of soil erosion. A large amount of organic matter in a soil improves the physical properties and allows the water to infiltrate into the soil more readily, thereby reducing the tendency for water to flow over the surface. Soils high in sand also take up water readily and are not so apt to erode due to water as those soils with more clay.
4. Length of Slopes: As water gathers greater momentum flowing down longer slopes, the erosion potential is increased.
5. Surface Cover: Soil with little or no cover is susceptible to erosion. Trees, bushes, grass or slash are highly effective in protecting against erosion.

TABLE 8.5.1

SECTION 8.5 - EROSION
ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Types of Erosion	8.5.1	• Alberta Research Council Soil Survey (438–7555)
Soil Particle Size	8.5.1	• Alberta Agriculture (427–5373)
Slope of Terrain	8.5.1	• Same as above
Topographic Position (climatic effects)	8.5.1	• Same as above
Surface Cover	8.5.1	• Same as above
Burning	8.4.2.1	• See Appendix C for Forestry and Public Lands regional offices.
Resource Information	Appendix B	• Air Photos (427–3519) • Maps (427–3520 or 297–7389)
Drainage and Construction of Waterways and Ditches	8.5.2.1	• See Appendix C for Forestry and Public Lands regional offices.
Culverts	8.2 8.5.2.2	• Same as above
Bridge Considerations	8.5.2.3 8.2	• Same as above • Fish and Wildlife regional offices. • Alberta Environment Regional Water Administration Division offices.
Roadway Surfaces	8.5.2.4	• See Appendix C for regional offices of Forestry and Public Lands, AFLW and Alberta Transportation and Utilities.
Slope Stability	8.5.2.5	• Same as above
Wind Erosion	8.5.2.6	• Same as above
Revegetation	8.5.2.7, 8.4.4	• See Appendix C for regional offices of Land Conservation and Reclamation Council and Forestry and Public Lands.

Table 8.5.2

GUIDE FOR ASSESSING SOIL EROSION HAZARD

		SLOPE				
SURFICIAL MATERIAL	TEXTURE	0 - 3° 0 - 5%	3 - 5° 5 - 9%	5 - 17° 9 - 30%	17 - 31° 30 - 60%	31° 60%
Lacustrine	Fine	Moderate	High	High	High	High
Organic	–	Moderate	High	High	High	High
Aeolian-alluvial	Fine	Moderate	Moderate	High	High	High
Morainal Till	Medium	Low	Low	Moderate	High	High
Alluvial (river terrace)	Medium to coarse	Low	Low	Moderate	High	High
Fluvial	Coarse	Low	Low	Low	Moderate	High

8.5.2 GUIDELINES FOR EROSION CONTROL AND RESTORATION OF ERODED AREAS

8.5.2.1 Drainage and Construction of Waterways and Ditches

The objective in design and construction of drainage waterways and ditches is to control runoff water with minimal alteration of natural landscape and habitats, some of which depend on runoff water for their maintenance (e.g. marshes, which are important for waterfowl production).

The following guidelines are designed to minimize erosion:

1. Reduce velocities of runoff water in ditches and waterways as much as is practical. This can be achieved by limiting the ditch gradient and/or by installation of energy dissipation structures and devices in the watercourse. The following methods have been used successfully:
   a) Straw bale barriers, when properly installed, adequately filter out sediments from the runoff waters. The disadvantage of straw bales is their degradability, necessitating removal and replacement every year. Flow through straw bales is slow and a large volume is required for adequate control. Although straw is readily available in many agricultural areas, shipment costs may be prohibitive in some areas.
   b) Temporary rip-rap made of sacked sand or stones can be piled in the watercourse (see Figure 8.5.1). The advantage of using this method is that the rip-rap can be installed in increments as needed. The main disadvantage is the relatively high cost.
   c) Other energy dissipators, such as cascades, can be built if timber is readily available.
   d) The various methods can be used together.
2. The cross-section profile should be either trapezoidal or parabolic. V-shaped ditches are prone to erosion and should not be considered unless protected with coarse granular material.
3. Rock rip-rap for ditch dam checks should be placed up both sides of the ditch to cover the wetted perimeter. Timber or sand bags may be used in the same fashion where rock is unavailable.
4. During construction of drainage ditches, temporary sediment catch basins should be constructed. Provisions should be made in the contract for the cleanout of temporary sediment catch basins during construction.
5. The need for erosion control structures and their maintenance can be reduced through revegetation of ditch slopes. The vegetation also increases the aesthetic quality of the right-of-way. For more detail, see Section 8.5.2.7.

8.5.2.2 Culverts

The main purpose of a culvert crossing is to provide a structurally sound overpass for streams of small to medium size. (See Section 8.2 for details on culverts). With respect to erosion and erosion control, the following guidelines should be noted (AF&WD 1982; AFS 1984 and Alberta Environment):

1. A culvert crossing should be designed based on an on-site investigation by an experienced hydraulic engineer.
2. If the stream is known to support fish, the culvert must be designed to allow fish to pass through. For details, see Section 8.2.
3. Culvert inverts should be slightly below the mean stream bed to lower the outfall velocity of water. Plunge pools should be avoided because they invariably promote downstream erosion.
4. Rip-rap or a concrete apron is normally recommended for intake and outfall slopes of all larger culverts as shown in Figure 8.5.1 and Figure 8.2.7. This measure prevents slope instability, scour and washouts.

8.5.2.3 Bridge Considerations

All plans for stream crossings (both temporary and permanent, including bridges) must be submitted for approval to the Regional Office of the Water Administration Division, Alberta Environment (see Section 8.2). With respect to erosion and sediment control, the following guidelines should be noted:

1. Stream banks at the bridge site must be analyzed to assess their stability. This will include obtaining geotechnical information on the banks' composition, vegetation cover and channel geometry at the site.
2. Rip-rap or other scour protection devices are essential around bridge approaches and piers.
3. Where feasible culverts should be placed in approach grades on each side of bridges (typically 15 to 30m away) to divert silt laden waters from streams into more stable forest cover (see Figure 8.5.2).
4. Bridges do not have to be completely constructed on-site. Preference should be given to prefabricated bridges that can be transported to the site. This will minimize work adjacent to the watercourse that may result in stream bank erosion and stream siltation (see Figure 8.2.1).
5. Any bridge and associated protection works, abutments and piers must be designed and constructed to ensure:
    a) that the permanent bridge deck is above the 1:100 year flood level with clearance for floating debris
    b) that the temporary bridge deck is above the 1:25 year flood level with clearance for floating debris
    c) that the hydraulic capacity of the watercourse is not adversely affected upstream or downstream
    d) that the potential is minimized for abnormal bed scour, pier scour or abutment scour, which may endanger the stability of the structure or alter the watercourse
    e) that ice or ice movement and floating debris will not affect the stability of the bridge or create a potential for a blockage that could result in flooding.

8.5.2.4 Roadway Surfaces

The following methods have been successfully used to control erosion on roadway surfaces (AFS, 1984; PITS, 1979):

1. Cross ditching (see Figure 8.5.3) is used to intercept and divert surface runoff from roadways or exploration cutlines to areas of heavy vegetation or brush.

2. Berms to direct surface water to a protected ditch. For effective erosion control, berms should be cut at intervals along the sidehill line allowing water to be diverted into nearby vegetative cover. For a typical opening interval in berms, see Table 8.5.2. (Utilization of berms is a part of good construction procedures.)
3. Surface compaction and aggregate cover should be used to minimize surface erosion during construction. The aggregate may be used as part of a future, more permanent base for the road surface.
4. Underlay felt liners, geotextiles, or filtermats offer a wide range of solutions to problems caused by poor soil and drainage conditions. The prime function of liners is to allow the free passage of water, without pressure build-up, while preventing the passage of fine soil particles. In addition, these liners usually have high tensile strength and flexibility, both excellent soil reinforcement properties.

Table 8.5.3

INTERVAL FOR OPENINGS IN BERMS AND CROSS TRENCHES (AFLW #1, 1984)

	SOIL CONDITION		
Slope Gradient	**(Fine Textured Erodible Soils e.g. silts & clays)**	**Normal (Medium Textured e.g. loams)**	**Rocky (Coarse Textured e.g. sands & gravels)**
Gentle (under 5%)	45m	60m	No Erosion
Moderate (5 - 10%)	30m	45m	60m
Steep (over 10%)	15m	30m	45m

Note:

1. Ditch must be constructed to allow vehicle crossover without destroying ditch.
2. Water must be diverted into heavy vegetation or brush.
3. Vegetative cover must be established immediately on right-of-way.

8.5.2.5 Slope Stability

Large cuts on sloping land may result in serious erosion. To prevent erosion on unstable slopes and to prevent sediment from these slopes entering streams, the following guidelines should be noted:

1. Depending on the gradient, obstructions to water runoff should be built. Obstructions that could be used include:
    a) replanting with shrubs and grass
    b) debris installed on the slope
    c) bales of straw
    d) rocks bigger than 100mm mesh size
    e) sacks of sand
    f) logs thicker than 100mm diameter
    g) trees and stumps imbedded in the slope to reduce surface flow (mud slides).
2. Stabilizing structures include:
    a) gabions
    b) contour trenching
    c) berms
    d) terraces

   e) equalizer dams.

3. On steeply-sloping terrain, trees should be cut by hand close to the ground, lopped and left lying to act as erosion barriers.
4. Erosion control measures include suitable slope design. Typical slope designs are indicated in Table 8.5.4.

Table 8.5.4

BACK-SLOPE AND FILL-SLOPE ANGLES FOR DIFFERENT SOIL MATERIALS

Back Slopes		Fill Slopes	
Flatground cuts under 3 feet	2:1	Common for most soil types	1-1/2:1
For most soil types with ground slopes under 55%	1:1	Alluvial soils	2:1
		Ballast	1:1
		Clay	4-1:1
For most soil types with ground slopes over 55%	3/4:1	Rock crushed	1-1/4:1
		Gravel	1:1
Hardpan or soft rock	1/2:1	Sand Moist	1-1/2-1:1
		Sand Saturated	2:1
Solid rock	1/4:1	Shale	1-1/2:1

5. On cut slopes, the following erosion control practices have been used successfully:
   a) Temporary cover (e.g. plastic sheets and liners). Among the advantages of this technique are availability and ease of installation and removal. The disadvantages include the need to anchor the plastic to prevent wind damage and the short life of the liners. Soil surfaces usually require additional treatment when the plastic is removed.

   b) Step slopes (Figure 8.5.4) lower the velocity of surface runoff water, collect sediment and hold moisture well. Their main disadvantage is the high cost of construction and maintenance. Minor sloughing may occur if the underlying soil is saturated with water.

   c) Diversion berms divert water from the cut to drains or ditches. Their main advantage is that they may be constructed before grading is started. Their disadvantages include the difficulty of building the berm on steep slopes or rocky surfaces. High velocities of water along the berm may require additional energy dissipation devices. The berm may cause saturation of soil and sloughing of the cut slope.

   d) Gabions are commonly used as bank stabilizers. Typical gabions consist of wire mesh containers filled with stone or rock available on-site.
6. On fill slopes, the following erosion control practices have been used:
   a) Berms on the top of the embankment (Figure 8.5.5) prevent runoff and divert the water to slope drains. Berms can be placed at the time of embankment construction or incorporated into the fill of shoulders. Sediment build-up resulting in berm failure is one of the disadvantages.

   b) Slope drains (Figure 8.5.6) prevent fill slope erosion by providing controlled surface water runoff to drain the embankment. Materials successfully used include: full or half sections of pipe, rip-rap, concrete, asphalt and plastic liners. Slope drains can be built as construction progresses, and may be either temporary or permanent.

    c) Fill berms or benches (Figure 8.5.7) slow the velocity of runoff water on long slopes and provide platforms for maintenance of the slope and slope drains. Their main disadvantage is their relatively high cost of construction. Additional fill material is usually needed.

7. Non-vegetative soil stabilization techniques may be used which include the following:
    a) mulches
    b) erosion mats
    c) jute netting
    d) chemical binders.
8. Mulching is important in establishing vegetation on steep construction slopes and other critical areas. A mulch cover will hold moisture, protect soil from water and wind erosion, hold seed in place and keep soil temperature more constant. After seeding, it can be applied uniformly by mechanical means or by hand. Common types of mulching material used in critical areas are hay, small grain straw, straw-asphalt, wood-fiber mulches, bark and wood chips, peat moss and jute matting. Wood chipping machines can be used to produce wood chips from nonsalvageable timber in remote areas.

    Some soil should be visible through a straw mulch. Mulching is necessary on steep and critical areas, but is expensive. Very early application in the spring may retard the rate at which soils warm-up.

    On north-facing slopes a dark coloured binder will increase the surface temperature and promote early growth. Care must be taken in applying a binder simultaneously with mulch and seed to ensure that there is contact between the seed and soil. Seed coated with binder may germinate slowly or not at all.

8.5.2.6 Soil Stability and Wind Erosion

The degree of wind erosion is dependent upon wind velocity, soil type and vegetation cover. Sandy soils are more susceptible than loam, especially when the vegetation cover is disturbed. The following guidelines should be noted:

1. The site or route selection process should evaluate the wind erosion potential based on:
    a) Distribution of sandy soils or sand dunes in Alberta. Southern and southeastern portions of Alberta present particular problems with sandy soil (see Appendix B, Section B.2.2).
    b) On-site assessment of vegetation cover integrity.
2. During construction, bulldozer operators should be cautioned not to scrape the top surface unnecessarily and remove vegetation. This will eliminate the effects of wind erosion.

8.5.2.7 Revegetation

The prime purpose of revegetation, particularly seeding to grass, is to establish a dense root system which will defend against soil erosion. The following guidelines should be noted:

1. Selection of the various types of vegetation available should be made on the basis of the particular soil involved, taking into consideration the factors affecting erosion in the area requiring revegetation. Sites differ and evaluation of the best vegetative and fertilizer mixture can be determined using these guidelines:
    a) Observe past successes in the area on similar sites.
    b) Obtain professional advice from persons with experience in the area or on similar sites.
    c) Obtain a soil analysis to determine suitable fertilizer and vegetation species seed. Alberta Agriculture, Soils Branch may provide assistance. Refer to Section 8.4 for more information.

2. Preparation of surface: Depressions created by bulldozer cleats could be used to assist in establishing a vegetative cover as they provide moisture retention. The final pass of the cat should be straight up and down the slope to create small terraces to hold the seed.

   Some general seed and fertilizer mixtures known to have been successful in the past are provided in Section 8.4. The mixtures outlined are being listed for general reference only. The landowner or District Forest Officer should be consulted for recommended mixtures in specific areas.

For more information on erosion control, the handbook User should refer to:

1. **Guidelines for the Reclamation of Linear Disturbances**

   Information: The document provides guidelines on erosion and revegetation with excellent photographs of examples.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

2. **Erosion Potential Index**

   Information: The document provides preventive and mitigative measures to prevent erosion.

   Available: Information Centre, AFLW
   phone: (403) 427-3590.

8.6 CAMPS AND CAMP OPERATIONS

Environmental protection measures for camps and camp operations are designed to:

1. minimize wildlife harassment
2. ensure acceptable waste effluent quality
3. provide methods of collection, transportation and processing of sewage and solid wastes
4. define the requirements for fuel handling and storage facilities
5. ensure proper site restoration after removal of camp facilities.

Table 8.6.1 is a quick reference which outlines environmental concerns, the location of information within this handbook, and the regulatory contact for each environmental concern.

8.6.1 CAMP LOCATION AND CAMP RULES

The following guidelines should be noted:

1. Camps and staging areas must be sited to provide easy and safe access.
2. All camp facilities should be at least 100m from the shore or banks of any watercourse.
3. Sites should be selected so that several operations can be carried out from each camp. A well laid out campsite using trees as buffer screens is shown in Figure 8.6.1.
4. Campsites should avoid areas where wildlife harassment may become a problem. The potential for harassment depends on the time of the year, duration of camp operation, and wildlife utilization of the area. The Wildlife Officer responsible for the particular area should be contacted for further details.
5. Animal feeding should be strictly forbidden and food should be stored so that animals are not attracted to it.
6. Only designated persons should be allowed to have firearms at the campsite and these firearms are to be used for protective purposes only.
7. Use of all-terrain vehicles (ATV) by camp personnel must be controlled to ensure harassment to wildlife is kept to a minimum. Camp personnel should not be allowed to utilize ATV for recreational purposes outside the campsite boundaries.
8. Meadows in forested areas are often important for wildlife. Such areas should be avoided when locating the camp, roads or other facilities.

8.6.2. POTABLE WATER

Facilities which construct and/or operate their own potable water system (i.e. do not obtain potable water from a municipal water supply system) may require approval for the withdrawal of surface and/or groundwater for potable purposes from the Water Resources Administration Division of Alberta Environment and may also require approval for the design, construction and operation of such systems from the Standards and Approvals Division of Alberta Environment (see Appendix C).

In general the minimum treatment requirements for all surface water and shallow groundwater supplies (less than 15m) is filtration and disinfection. Disinfection is recommended for deep groundwater supplies. All potable water, regardless of the supply source, must meet the health related quality standards as outlined in the latest edition of Health and Welfare Canada "Guidelines for Canadian Drinking Water Quality."

8.6.3 SEWAGE EFFLUENT AND WASTEWATER TREATMENT

8.6.3.1 Sewage Effluent Objectives

The Standards and Approvals Division of Alberta Environment has established standards and guidelines for the treatment and discharge of municipal and industrial wastewaters. Wastewater treatment may be achieved through mechanical treatment or lagoons, and effluent standards are established based on the

TABLE 8.6.1

SECTION 8.5 - CAMPS AND CAMP OPERATIONS ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Camp Location	8.6.1	• For Crown land, see Appendix C for Forestry and Public Lands regional offices of AFLW. • For patented land see the landowner.
Drinking Water (potable water)	8.6.2	• Alberta Environment, Standards and Approvals Division (427–5877).
Sewage Effluent and Wastewater Treatment	8.6.3	• Same as above
Solid Waste Disposal, (Collection, Landfill, Incineration)	8.6.4, 8.7.5 8.7.7.4	• Same as above
Fuel Handling and Storage	8.6.5, 8.4, 4.3.6, 5.3.5	• See Appendix C for Forestry and Public Lands regional offices of AFLW.
Restoration	8.6.6, 8.4.4	• Same as above • Regional offices of the Land Conservation and Reclamation Council.

frequency of discharge (continuous discharge from mechanical plants and seasonal discharge from lagoons), the capability of various technologies to treat the wastewater, and the water quality of the receiving stream.

Where feasible, work camp wastewater should be hauled or discharged to an approved municipal wastewater treatment system. If discharge of wastewater upstream of the public water supply or recreational areas cannot be avoided, Alberta Environment may require additional treatment such as effluent disinfection.

Prior to construction or operation of any municipal or industrial wastewater treatment facility in Alberta, the owner of the facility shall apply for and obtain approval from the Director of Standards and Approvals Division, Alberta Environment.

No effluent should be discharged unless it satisfies the following conditions:

1. Free from anything that will settle and form putrescent or otherwise objectional sludge deposits.
2. Free from floating debris, oil, scum and other floating materials in amounts sufficient to be unsightly or deleterious.
3. Free from materials producing colour, turbidity or odour in such a degree as to create a nuisance.
4. Free from substances in concentrations or combinations which are toxic or harmful to human, animal or aquatic life.
5. Treatment should produce an effluent of the following quality limits:
    a) Total 5-day biochemical oxygen demand (B.O.D.) not to exceed 20 mg/l.
    b) Total suspended solids (T.S.S.) not to exceed 25 mg/l.
    c) Fecal coliforms not to exceed 400 per 100 ml.
    d) Chlorine residual in the range of 0.5 mg/l minimum and 1.50 mg/l maximum after a minimum of 30 minutes contact time application where disinfection is necessary and chlorination is used for disinfection purposes. The above limits must be met without dilution of the effluent from either a treatment works or any wastewater source.
    e) pH range between 6 to 9.
    f) Phenols not to exceed 0.02 mg/l.
    g) Oils and greases not to exceed 15 mg/l.
6. The mixing zone of the treated effluent with the receiving stream should be designed to ensure a reasonable zone of passage for all indigenous aquatic life. Every precaution should be taken to ensure that at least two thirds of the total cross sectional area of the stream remains favorable to the aquatic community at all times. The water quality in this section of the stream should meet the following requirements downstream from the point of discharge:
    a) dissolved oxygen – minimum 5 mg/l or 60% of saturation – whichever is less
    b) biochemical oxygen demand – 4 mg/l unless background levels are higher;
7. Discharge in close proximity to public water supply sources, or recreation areas should be avoided. Where such discharges are unavoidable, chlorination operations must be checked daily to ensure proper treatment. The work camps should discharge their wastes into municipal systems wherever such arrangements are economically feasible. The municipal system can then handle the additional load and still comply with provincial objectives and regulations. In the Green Area, discharge of sewage effluent should be approved by the District Forest Officer.

8.6.3.2 Specific Waste Treatment System

The following are a series of systems available for sewage treatment. Detailed standards and guidelines for the design of sewage treatment works are available from the Muncipal Engineering Branch of the Standards and Approvals Division, Alberta Environment.

1. Packaged Treatment Plants

Biological and physical chemical package treatment plants can produce an effluent of the required quality. Operator time and maintenance costs are very high, however.

An adequate, heated, ventilated shelter should be provided for any package treatment facility. The building must have sufficient space to carry out routine quality control tests. A flow measurement device complete with meter should be installed to record effluent discharge. Daily flow records should be kept by the operator.

In addition to routine maintenance on plant equipment, the operator should be expected to perform simple quality control tests, and collect influent and effluent samples for analysis.

2. Lagoons

Lagoons require very little maintenance and, assuming land availability and proper soil conditions, are not costly to construct. A lagoon system should have sufficient capacity for the storage of work camp sewage for at least one year.

The shape of the lagoon cells is not critical but shortcircuiting and irregularly shaped pockets must be avoided. The depth of lagoons should not be less than 1m, nor greater than 1.5m. The berms should have a minimum 3:1 slope and the bottom of the lagoon should be level. Drain inlets should be installed 15cm above the lagoon bottom. The height of freeboard in lagoons should be a minimum of 60cm. Trees, brush, and topsoil must be removed from the immediate lagoon area.

Lagoons must not be located in areas where their presence would result in soil instability due to the saturation of soil or permafrost conditions, nor within 100m of a watercourse or the work camp proper. A separation of 300m is required from any residence not connected with the work camp. The minimum distance between a lagoon and any rural road should be at least 30m and 100 m from any primary or secondary highway. Lagoons shall be lined with impervious material (e.g. clay or plastic liners) in accordance with Alberta Environment requirements.

3. Subsurface Disposal

The design of any subsurface disposal system (septic tank with tile field, leach pits) should be based on the results of percolation tests performed in the soil where the system is to be installed. If a septic tank is used, it should be large enough to provide a 24-hour retention period for the raw sewage and an equal volume for sludge storage. If leach pits are constructed, they must have two compartments connected in series. The first cell would settle out solids and the second cell would be used for percolation. Depending on the use of subsurface disposal system (municipal or private) a construction approval may be required from either the Director of Standards and Approvals Division of Alberta Environment or the Chief Plumbing Inspector of Alberta Labour. An example of each system is shown in Figure 8.6.2.

The soil must be capable of leaching action throughout the winter. To keep the soil around the system from freezing, the warm kitchen wastewater and washwater should be discharged into the same system that is used for toilet wastes. A 50cm cover over the top of a leach pit should be adequate to conserve heat. Weeping tile may have to be laid at a depth of 1m below the surface and an insulating layer of straw or wood chips may be required to keep the field from freezing.

The leachate that percolates from the system through the soil must not contaminate groundwater which may have value as a public or private water supply. The disposal system must also be constructed in such a manner that odour problems do not occur. Although the ground surface over the system should not be used as a thoroughfare, it should be able to support pedestrian traffic and be clearly delineated so that heavy vehicles are not inadvertently driven on top.

The minimum recommended distances of subsurface disposal facilities from sources of water supply and natural water bodies are as follows:

a) Watertight septic tanks or pumpout tanks:

    (i) 3.0m from any cistern

(ii) 9.0m from any well

b) Leach Pits:

(i) 15m from any dwelling having a subsurface foundation

(ii) 15m from any cistern

(iii) 150m from any well, spring or watercourse

c) Weeping tile fields:

(i) 30m from any well

(ii) 60m from any spring or watercourse

The required separation between a particular subsurface disposal system and a water supply or watercourse will depend upon soil characteristics, sewage flow, direction of drainage, etc.

4. Holding Tanks

All holding tanks should be adequately vented and, if not located in a heated enclosure, insulated to prevent sewage freezing on the walls of the tank. The tanks should have sufficient capacity to contain sewage flow over two days. Consideration should be given to using minimum flush toilets in conjunction with holding tanks to reduce water consumption and tank size (Figure 8.6.3).

Sewage trucks should be used solely for the purpose of hauling sewage. Pump-out and hauling operations should be carried out in a manner that does not expose the driver or people in the area where the tanks are emptied to any health hazard. Every effort should be taken to avoid spillage when holding tanks are emptied, when the sewage truck is in transit, and when the truck contents are discharged into a treatment facility. If camp sewage is to be hauled to a municipal treatment facility, prior approval must be obtained from the municipality. Disposal areas must be approved by the Forest or Land Use Officer.

5. Incineration (See ERCB IL 81-10)

If an incinerator is used to dispose of all or part of the camp sewage, it should:

a) be approved by Alberta Environment for adherence to atmospheric emission objectives

b) comply with all safety regulations

c) be housed or enclosed in a manner so that it can be operated during inclement weather

d) be capable of operating on a 24-hour basis

e) produce an ash which contains little or no burnable material

f) be operated by designated, responsible, properly trained personnel.

The incinerated residue may be buried in a suitable location approved by the District Forest Officer which is above the water table and covered over with at least 0.6m of soil.

6. Disposal of Waste Oil and Toxic Wastes

Waste oil and other petroleum products, as well as hazardous and toxic wastes such as pesticides, poisons, solvents, greases etc., should not be disposed of in a landfill. Waste oil may be used for dust control, provided that approval has been granted for its application in specified areas by the Forest or Land Use Officer and the ERCB. Waste oil and other petroleum products not disposed of in this manner must be incinerated in approved incinerator facilities (see item 5 above). All hazardous and toxic wastes and waste oil not burned or used for dust control should be transported off the site to the Swan Hills Hazardous Waste Facility.

The disposal of some oily wastes can be accomplished on-site by using deep well disposal methods. The Drilling and Production Section of the Development Department of the ERCB must be contacted when considering deep well disposal.

Figure 8.7.1 displays equipment and terms involved with deep well disposal.

8.6.4 SOLID WASTE DISPOSAL

Collection, storage, conveyance, and disposal operations should be carried out to ensure that:

1. scavengers and other wildlife are not attracted to the camp refuse either prior to collection or after disposal
2. wind blown trash is minimized
3. no odour emission problems are produced by disposal or processing operations (open pit burning should be avoided)
4. no public health hazards are created
5. upon closure of the site, the disposal site is restored as close as possible to original conditions
6. toxic wastes are moved to a secure area in a safe manner or transported out of the area.

Industrial landfill and incineration, followed by burial of the incinerated residue, are the most commonly used methods for disposal of solid wastes. Providing soil conditions are favourable, permafrost is absent, and the groundwater table is low, landfill is perhaps the more economical method. Incineration, although considerably more expensive than landfill, is a convenient processing method provided the equipment is well designed and properly operated and maintained. The distance that the collected refuse is hauled is minimized and, due to volume reduction, only a small area of land is required to bury the incinerated residue. Incineration of waste materials must be approved by the Standards and Approvals Division, Alberta Environment.

Other less frequently used and more expensive methods include composting, pyrolysis, recycling, grinding and discharge into sanitary sewers, and shredding or baling followed by industrial landfill. With the exception of the last two, these methods are not considered practical for disposing of camp solid wastes. Shredding or baling may prove to be economical in winter or where suitable landfill areas are limited. Using a garburator for grinding and discharging putrescible kitchen wastes into the camp sewerage systems may prove to be a suitable method of disposal since it eliminates the storage and disposal of wastes which attract animals.

8.6.4.1 Collection, Storage and Conveyance

Putrescible wastes that attract scavengers should be placed in suitable containers that have tight-fitting lids. When full, the containers should be placed in an enclosed ventilated area to prevent access by wildlife. This type of refuse should be picked up and hauled to the disposal site every day. Other non-putrescible refuse should be picked up as required.

If a conveyor is required, it should transport refuse without causing litter between the disposal site and the collection area. Between uses, it should be kept clean and free of refuse material.

8.6.4.2 Industrial Landfill

Site Selection and Preparation: The site for any industrial landfill should be selected so that the distance from the edge of the site to any water body or the work camp is at least 100m, but preferably 300m. A distance of at least 300m should be maintained between the landfill and any habitation not connected with the work camp. Whether the trench or area fill method of operation is employed, the bottom of the landfill should be a minimum of 1.5m above the ground water table. Surface runoff should be diverted away from the site to keep the working area dry. For access, an all season road should be constructed to the site. There should be a minimum of 30m of natural undisturbed growth between the edge of the site and any highway. Any topsoil that is excavated for site preparation should be pushed to one side for pit restoration.

Methods of Operation: The two common methods of operation of a landfill are the trench and area fill. The objectives of both methods are identical: to compact refuse thoroughly and cover it promptly and completely.

The area fill method (or progressive slope or ramp) is used for low elevation sites such as quarries, pits, ravines and canyons (see Figure 8.6.4).

The following operating guidelines for area fill are recommended:

1. Deposit refuse at the bottom of slopes for best compaction and control of blowing litter.
2. Spread and compact refuse against the slope of the previous lift, progressing horizontally along the slope.
3. Cover with earth excavated from adjacent areas or from an off-site borrow area, then compact. The thickness of the compacted layer should be at least 16cm.
4. A uniform layer of suitable cover material compacted to a minimum depth of 0.6m should be placed over the entire surface of each portion of the final lift, not later than one week following the placement of refuse within that portion.

The trench method is adapted to flat terrain (see Figure 8.6.5). The following operating techniques for the trench method are recommended:

1. Excavate the trenches to a maximum depth of 5m. This will result in a more economical use of the area for landfill operation. Trenches should be excavated on the windward edge of the site and perpendicular to the prevailing wind direction to minimize scattering of paper. The width of the trench should be about two times the width of a crawler tractor to allow for maximum compaction. Trenches should be parallel to each other and cover material should be obtained either from the trench excavation or from the adjacent trench which will be filled next.
2. Dump the refuse, preferably at the bottom of the trench, and spread and compact in layers. Cover layers with at least 15cm of compacted earth.
3. A uniform layer of suitable cover material compacted to a minimum depth of 0.6m should be placed over the entire surface of each portion of the final lift, not later than one week following the placement of refuse within that portion.

If the trench method is used, a large enough trench to contain refuse during the winter months should be excavated before freeze-up.

In both methods of operation it may be impossible to cover refuse during the winter when soil cannot reasonably be obtained. During this time, adequate controls must be maintained to prevent refuse from blowing about the site. Snow fences around trenches or around the working faces, if area fill is used, should considerably reduce blowing litter. Immediately after the soil has thawed and covering is possible, the whole area should be cleaned up and the required soil cover put in place.

Except during the winter, all putrescible refuse should be covered and compacted the same day the refuse is hauled to the landfill site. In order to reduce cover operations, a separate area of the site may be set aside for the deposition of inert refuse, such as wood, metal, abandoned vehicles and equipment. Coverage of such refuse is required once a year.

Closing the Landfill Site: When work camps are to be removed or when all available area in the landfill site has been used, the entire site and access road should be restored as close as possible to natural conditions. The final surface of the fill should be graded to a slope of at least one percent and be free of depressions that could cause ponding. No surface slope should be so steep as to cause erosion of the cover.

Topsoil should be placed over the site and seeded to grass. All accesses to the site should be removed.

8.6.4.3 Incineration

The following requirements are outlined in ERCB IL 81-10:

1. An incinerator for disposal of non-hydrocarbon combustible waste is required at or near each campsite associated with a well, battery, or scheme.
2. Garbage which may attract wildlife shall be incinerated at least daily.
3. Combustible waste from the well, battery, or scheme shall be contained at all times and incinerated as required.
4. Portable incinerators for the above use are exempted from Alberta Environment's approval requirements provided that they have a burning capacity of less that 907 kg per hour (200 pounds per hour) and are located at a site for less than one year.

5. The incinerator shall:
   a) be capable of burning all combustible waste to an inert ash
   b) incorporate a stack of suitable height and an effective spark arrestor
   c) be maintained in good operating condition such that warped components, leaks, refractory or other damage is repaired as soon as is practicable
   d) be provided with underfire air
   e) be provided with overfire air for all incinerator types excepting controlled air units.

Many wells, batteries, or schemes which do not have a camp associated with them may have insufficient waste to justify installation of an incinerator. On such sites, however, combustible waste must still be contained and disposed of with a frequency and in such a manner that no hazard or nuisance is created.

8.6.5 FUEL HANDLING AND STORAGE FACILITIES

In addition to complying with all provincial safety regulations and conditions contained in land-use authorizations, compliance with the following guidelines is recommended:

1. All above-ground bulk storage, with the exception of mobile tank trucks having a capacity greater than 4500 l (1000 Imperial gallons), should be adequately bermed with impervious material to contain any spillage. The volume of the bermed enclosure should be at least 110% of the bulk storage capacity (see Figure 3.3).
2. Bulk storage sites should be a minimum of 100m or more from any water body (the objective should be 300m).
3. Bulk storage units should be equipped with level indicators.
4. Caches of fuel oil drums should also be kept at least 100m from any natural watercourse.
5. The area around storage sites and fuel lines should be distinctly marked and kept clear of snow and debris to allow for routine inspection for possible leaks and to eliminate the risk of vehicles crossing over fuel lines.
6. All bulk handling operations must be closely supervised at all times.
7. It is essential that all spills be cleaned up immediately (see Sections 8.4, 4.3.6, 5.3.5).
8. All oil spills greater than 2 cubic metres on the lease site or any volume off the lease site must be reported immediately to the Local Area Office of the ERCB (see Appendix C and Figure 2.13). See Section 8.7.4 for information about the transportation of dangerous goods.

8.6.6 RESTORATION OF LANDSCAPE AFFECTED BY CAMP FACILITIES AND ACTIVITIES

Upon completion of the construction phase and the removal of camps and all related facilities, the landscape affected by the camp operation should be restored as closely as possible to original conditions unless otherwise requested by the Land Conservation and Reclamation Council.

Restoration of the landscape should include revegetation of the area with grasses, shrubs, and trees native to the area. Where required, the compacted soil must be broken up prior to seeding. Recommendations outlined in Section 8.4 regarding revegetation procedures should be followed.

All timber and debris not disposed of after the campsites were initially cleared should be salvaged or removed. All buildings, trailers, machinery, equipment, materials, litter, and storage containers should be removed from the area, and access roads from the highway to the campsites removed. Abandoned equipment should either be hauled out of the area or buried in a landfill site.

8.7 WASTE HANDLING

Table 8.7.1 is a quick reference which outlines environmental concerns, the location of information within this handbook, and the regulatory contact for each environmental concern.

8.7.1 DRILLING WASTES

Wastes related to drilling operations such as waste drilling fluids and, workover and completion wastes have been addressed in Section 4.3.5.

8.7.2 PRODUCTION WASTES

For oil production facilities, generated wastes are categorized as follows:

1. waste oil sludge
2. treater hay
3. oil spill debris.

For gas processing facilities, the generated wastes are:

1. holding pond sludges
2. process filters
3. spent iron sponge
4. boiler water/cooling tower blowdown
5. glycol
6. dessicants
7. catalysts
8. degradation products from amine and sulfinol treating
9. waste sulphur.

Guidelines for the disposal of wastes generated from production facilities are provided in Sections 5.3.7 and 5.3.8.

8.7.3 MISCELLANEOUS WASTES

Two miscellaneous wastes that should be considered are used drums and PCBs.

1. Used Drums

   Empty drums usually contain residual amounts of the original chemicals and could pose a threat to public health and safety or to the environment.

   Empty drums often find secondary uses such as garbage containers or for burning waste. Whenever a drum is reused for another purpose, new users must recognize what was previously contained in the drum and the associated risks.

   Frequently drums accumulate faster than they are disposed of or reused. Storage of used drums is not a method of ultimate disposal but is frequently unavoidable. Storage areas should be fenced to keep out domestic animals or wildlife. The area should be well drained and elevated. Drums should be stored on their sides to avoid the collection of water in the drums.

   Disposal of the drums as a hazardous waste is legislated under the Hazardous Waste Act.

   Possible disposal options are as follows:

   a) Preferred

      (i) Buy in bulk

      The number of drums for disposal can be reduced by buying in bulk amounts when possible.

TABLE 8.7.1

SECTION 8.7 - WASTE HANDLING ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Drilling Wastes	4.3.5, 8.7.1	• See Appendix C for regional offices of ERCB, Alberta Environment Standards and Approvals Division (427–5883) and Waste Management Branch Branch (427–5868)
Production Wastes	8.7.2, 5.3.7 5.3.8	• Same as above
Miscellaneous Wastes (used drums, PCB's)	8.7.3	• Same as above
Transportation of Dangerous Goods	8.7.4	• Same as above • Alberta Public Safety Service (422–9600).
General Solid Wastes	8.7.5, 8.6.4	• See Appendix C for regional offices of ERCB, Alberta Environment Waste Management Branch (427-5868)
Sanitary Wastes	8.6.3	• Alberta Environment Waste Management Branch (427-5868)
Waste Management	8.7.7	• Same as above
Manifesting	8.7.7.1	• Same as above
Deepwell Disposal	8.7.7.2	• Same as above
Surface Water (Off-site Drainage)	8.7.7.3	• Same as above
Landfilling	8.7.7.4, 8.6.4	• Same as above
Land Application of Wastes	8.7.7.6	• Same as above
Hazardous Waste Disposal	4.3.5, 8.7.2	• Waste Management Corporation for the Swan Hills Hazardous Waste Facility (422–5029) • Chem Securities (250–3742)
EMERGENCY		• **ALBERTA ENVIRONMENT POLLUTION EMERGENCY RESPONSE TEAM (PERT) EMERGENCY RESPONSE NUMBER (1-800-222-6514)**

(ii) Return drums to vendor

In many cases drums are used to deliver specialty chemicals. Considerable reluctance has been noted on the part of many chemical suppliers to accept the empty drums after use. Consideration should be given to establishing a drum return clause in contracts at the bid and requisition stage so that the supplier may "build in" the cost of drum recycling. In most cases the cost of transport equals or exceeds the actual disposal costs, so considerable savings can be made by using the back haul capability of chemical suppliers.

(iii) Wash, crush and landfill

Caution must be used with this alternative. The Hazardous Waste Act legislates the disposal of used drums. Used drums may require washing prior to reuse or disposal. Wash water must be handled in a safe way recognizing that it will contain significant amounts of the original material. For example, the drum residue should be washed into the process stream (assuming the extra volume of wash water is acceptable).

Pesticide containers should be thoroughly drained to the spray tank and triple rinsed (about 1/4 full with each rinse) into the spray tank. The container should be punctured and delivered to an approved container collection sites. For more information, contact Alberta Environment, Pollution Control Division (see Appendix C).

Used drums that are cleaned of residues may be crushed and taken to landfill sites for burial.

b) Acceptable (not a permanent solution but generally safe)

(i) Drum reclaimers

A drum reclaiming firm can be contracted to clean and recondition the drums for reuse. The producing company should ensure that the drum waste disposal methods used by the contractor are environmentally acceptable prior to signing a contract.

c) Unacceptable (will lead to pollution problems)

(i) Uncontrolled or long term storage of unmarked drums

Drums which contain residues of the original material will eventually leak.

(ii) Careless disposal of drum washings

The object of washing the drum is not only to get the drum clean but to remove any harmful residue which may leak to the environment. This objective is defeated if the wash water is merely sprayed on a field or into a creek.

2. PCBs

Polychlorinated Biphenyl (PCB) is the scientific name for a group of man-made liquid chemicals that have the unique characteristics of being highly stable, non-corroding and extremely fire resistant. There are several different chemical varieties of PCB.

Since the 1930s, PCBs have been widely used in electrical transformers and capacitors. Trade names include "Askarel", "Inerteen" and "Pyranol". The PCB is part of a blend with other chemicals.

Most of the PCBs used in the oil industry are in capacitors at field locations (e.g. pump jack motors). Table 8.7.2 summarizes the PCBs in use.

Table 8.7.2
1982 ENVIRONMENT CANADA PCB INVENTORY

	Petroleum Industry (tonnes)	Total
Alberta	53.5	420.8
British Columbia	3.7	1,949.2
Saskatchewan	0.8	230.5
Total Canada	92.3	17,171.6

Much public and scientific concern has been expressed about the presence of PCBs in the environment and in our food. The major concern is the long-term cumulative effect of exposure to PCBs on the health of humans and all life forms. Since 1977, its production has been banned in Canada and the United States, and strict controls to ultimately eliminate them have been enacted.

PCBs should not be confused with mineral oil. Mineral oil is sometimes used in the same types of electrical equipment as an alternative to Askarel. The most obvious differences between the two liquids are that Askarel has a very strong bitter smell and is heavier than water, whereas mineral oil has an oily smell and is lighter than water.

The physical characteristics of PCBs are as follows:

a) colour – crystal clear to pale yellow
b) vapours – invisible
c) odour – bitter smell
d) texture – somewhat slippery
e) density – heavier than water.

PCBs used in equipment may become contaminated with impurities such as dirt, moisture, black carbon particles due to arcing, and bits of insulation from inside the equipment. These impurities will degrade the electrical performance of the fluid, as well as make it appear cloudy or darker in colour. Other impurities may cause a light brown, green, red or blue tinge.

As well as having many attractive chemical properties, PCBs have the unattractive property of being essentially non-biodegradable.

PCBs which leak from damaged or rusted electrical equipment or which are spilled onto the ground can eventually seep into streams, rivers and lakes. If inadvertently poured into sewage drains for disposal, caution should be exercised in using the sewage sludge as a fertilizer.

Once into the environment, PCBs can accumulate in the bodies of all types of life. The contamination is then passed on through the food chain.

PCBs can be handled safely by observing routine precautions. Such precautions should apply whether the purpose of the job is to work on a piece of equipment containing PCBs or simply to move a drum from one location to another.

a) Wear proper clothing to protect against the hazard of splashes or spills.
The following garments are considered appropriate for handling PCBs:
    i) coated gloves
    ii) a safety hat fitted with a face shield
    iii) a splash apron made of PVA, Viton material by Dupont, or Teflon
    iv) disposable clothing which can be discarded after handling PCBs
    v) boots or rubber boots.

b) Provide additional air ventilation when working with PCB fluids hotter than 55 C.

The fumes from hot PCB fluids (55 C) can be very irritating to the eyes and lungs. At room temperature (25 C), the fumes are not so irritating. If exposure to hot PCB fluids is necessary, such as under emergency conditions, an approved gas mask with an organic cannister or self-contained breathing apparatus should be worn. An application of caster oil will help to provide a barrier against irritation of PCB vapours on unprotected skin.

c) Items contaminated by PCBs should never be burned. Ordinary incineration will allow PCB to become airborne.

For further information on disposal, the handbook user should contact Alberta Environment Standards and Approvals Division, Industrial Waste Branch.

Disposal of PCB contaminated items is legislated by the Hazardous Waste Act. Environment Canada's "Handbook on PCBs in Electrical Equipment" contains recommendations for selecting a site for storage of large quantities of PCBs. Basically, the requirement for storage is a secure indoor area where the possibility of damage is minimal and where any spills would be contained.

To ensure a proper inventory is maintained on PCBs, the following information should be entered on the "Record of PCB Storage and Disposal" form and sent to the Environmental Protection Service:

(i)	PCB Label No.	This is the two letter, five digit serial number on the black-and-white PCB warning label.
(ii)	Plant or Field Location	
(iii)	Manufacturer	e.g. Westinghouse
(iv)	Size Rating	e.g. 40 KVAR
(v)	Model No.	e.g. KX 1854
(vi)	Serial No.	e.g. 1240803Y
(vii)	Date of Storage	
(viii)	Exact Storage Location	The building or room and the plant/field location.
(ix)	Date of Disposal	
(x)	Disposal Details	The company that removed the waste and the location of their storage site.
(xi)	PCB Quantity (litres)	This is important. If not supplied by operations personnel it should be estimated from the list of PCB containing equipment for the location, or obtained from the equipment manufacturer.

A record is needed of all the PCBs handled to ensure that:

i) The Environment Protection Service's inventory is current

ii) An EPS warning label is affixed.

When any PCB is disposed of, the Environmental Protection Service must be notified to update their inventory. A letter should be sent to:

Environmental Protection Service,
Environment Canada

Atten: Contaminants Officer

It should relate all information available except date of storage and exact storage location. The "Record of PCB Storage and Disposal" sheet containing the necessary information should be attached to the letter.

At the present time there is only one method of disposal. The procedure is as follows:

i) safe storage

ii) shipment to a secure storage area

iii) secure storage until the PCB can be transported to and destroyed at the Swan Hills Hazardous Waste Facility

iv) equipment containing PCBs must not be dismantled for the purpose of selling it for scrap.

When disposing of capacitors containing PCBs the following should be observed:

i) A black-and-white serialized PCB warning label, available from the Environmental Protection Service of Environment Canada, should be placed on the capacitor or casing.

ii) The equipment should be wrapped in a heavy plastic bag.

iii) It should then be placed, with the terminals up to prevent leakage, in a No. 16 gauge steel drum with a removable steel lid.

iv) Sawdust should be used to pack the spaces in the barrel.

v) The drum should be sealed and a black-and-white non-serialized PCB warning label placed on the drum.

When disposing of a transformer containing PCBs, the following procedure should be followed:

i) A liquid containment system should be placed under the transformer.

ii) Before moving any PCB-filled transformer, the contents should be pumped into a good quality double-bung, steel drum of No. 16 gauge or heavier, using a pump and hoses devoted specially to handling PCB liquids. Cleanup materials should be kept handy in case of an accidental spill.

iii) If a transformer **must** be partially dismantled before moving, it should first have a **triple rinse** with a suitable solvent such as trichlorobenzene, kerosene, or fuel oil. The transformer should sit for 18 hours or more following each solvent addition, to allow the solvent to soak into the transformer core. Following each soaking period, the contaminated solvent should be pumped from the transformer into drums. This procedure removes most, but not all, of the PCBs from the transformer. The transformer should still be considered a possible contamination source. Following the rinse, the transformer may be dismantled as necessary.

iv) All drippings in the area should be wiped up and the wastes should be properly disposed of.

v) A black-and-white serialized PCB warning label, available from the Environment Protection Service of Environment Canada, should be placed on the transformer casing.

vi) A protective crate should be built around the transformer for moving, ensuring that the drain spouts are protected from damage.

vii) The transformer should then be moved to the storage area using routine handling precautions.

Anything which comes into contact with PCBs should be contained for disposal. Items to be disposed of can include: discarded capacitors and transformers, contaminated PCB fluids, earth and gravel, clothing, cleanup materials and pieces of wood.

8.7.4 TRANSPORTATION OF DANGEROUS GOODS

If dangerous goods (e.g. waste materials) are transported to a disposal site, it is important to be aware and understand the regulations that Transport Canada has established regarding the transport of these wastes.

The "Transportation of Dangerous Goods Act and Regulations" are intended to promote public safety when transporting dangerous goods in Canada. The regulations prescribe safety standards and safety requirements for the handling, offering for transport and transporting of dangerous goods, and provide mechanisms for communicating the relative degree and the nature of the hazard.

Complementary Federal, Provincial and Territorial legislation, developed in consultation with industry, was enacted to consolidate a number of previously uncoordinated and separately administered Acts and regulations.

Requirements will be applied uniformly across the country since the "Transportation of Dangerous Goods Act and Regulations" apply to all types of dangerous goods and to all modes of transport. These regulations automatically prevail with respect to any inconsistencies with other Federal regulations. Where they do not address a particular aspect, all applicable existing regulations still apply. This principle also applies in several of the provinces with respect to their provincial legislation.

Publications detailing the carrier's responsibilities, documentation requirements, signage, emergency response plans, training permits, penalties and other safety standards and requirements are available from Transport Canada.

The types of categories that are considered under the Transportation of Dangerous Goods Act are:

1.	Class 1	Explosives
2.	Class 2	Gases
3.	Class 3	Flammable Liquids
4.	Class 4	Flammable Solids
5.	Class 5	Oxidizing Substances and Organic Peroxides
6.	Class 6	Poisonous (toxic) substances and infectious substances
7.	Class 7	Radioactive materials
8.	Class 8	Corrosive materials
9.	Class 9	Miscellaneous

There are a number of exemptions and the handbook User should obtain a copy of Transport Canada's "Dangerous Goods – Carriers Basic Responsibilities." This document is available from Alberta Public Safety Services (phone: (403) 422-9600).

8.7.5 GENERAL SOLID WASTES

In any petroleum activity there are general solid wastes which are generated. Methods of disposal for these wastes include landfill and incineration. Such wastes include:

1. rags
2. waste paper, paper cartons, etc.
3. scrap metal
4. plastic and rubber wastes.

The following guidelines should be observed:

1. All garbage must be thoroughly burned in a designated area, as approved by the District Forest Officer or Land Use Officer. If an incinerator is used a permit is required under the Clean Air Act. Contact the Air Quality Division, Alberta Environment.
2. Garbage must be burned daily to avoid the accumulation of garbage which may attract wildlife.
3. At small camps, burning in open barrels is not permitted. Approved portable incinerators must be used.
4. Where waste material has not been totally consumed by burning, the residue may be disposed of as follows with the approval of the District Forest Officer:
    a) On well sites within the Green Area, any residue may be compacted and buried in sump pits provided a minimum of 1m of mineral soil covers the debris and the natural ground contours are maintained.
    b) On roads where deep fills are required in the grade, residue may be compacted and buried provided that a minimum of 1m covers the residue and the natural ground contours are maintained.
5. The 1m of compacted mineral soil and natural ground contour rule also applies to residue buried in natural openings or in clearings adjacent to rights-of-way.

8.7.6 SANITARY WASTES

The handbook user should refer to Section 8.6 for camp operations. For more information, contact Alberta Environment, Standards and Approvals Division.

8.7.7 WASTE MANAGEMENT SYSTEMS

8.7.7.1 Waste Manifesting

Since transportation and disposal is frequently contracted to outside parties, manifest systems have been developed to track the fate of the disposed material to its final destination.

Alberta Environment has developed a manifest form for use with hazardous wastes. These forms can be obtained from Alberta Environment, Pollution Control Division. Remember, if there is a hazardous waste spill, phone the Emergency Response number at 1(800)-222-6514.

The CPA has developed an oilfield waste manifest form. Forms can be obtained from Trandek Press Limited, phone: (403) 266-7122.

Individual companies may wish to prepare their own form to develop waste generator numbers.

8.7.7.2 Deep Well Disposal and Water Reuse

Deep well injection is a commonly used method to dispose of liquid wastes, particularly saltwater (produced water), glycols and drilling workover or completion liquid wastes (see Figure 8.7.1). Emphasis, however, is now being placed on water reuse systems for produced waters. The ERCB does not consider deep well disposal to be the best applicable technology. For information on water reuse schemes the proponent should contact the Standards and Approvals Division, Alberta Environment (see Appendix C).

Guidelines for deep well disposal as provided by the ERCB in ID 81-1 are as follows:

1. Injection lines for deep well disposal should be located downstream (flow of the aquifer) of ponds, lakes, crops and dwellings.
2. Permission of an ERCB representative shall be obtained before any subsurface disposal operation is commenced.
3. The disposal zone shall be at a depth not less than 600 metres.
4. The resistivity directly attributable to the total natural dissolved solids in the formation water of the disposal zone shall be less than 0.33 OHM.M corrected to 20C (dissolved solids equivalent to or greater than 20,000 ppm).
5. The disposal zone shall be known not to contain hydrocarbons within 2 kilometres of the intended disposal well.
6. Where a well is to be abandoned or plugged back, and does not contain at least 600 metres of casing cemented in place:
   a) the disposal of fluids shall be through drill pipe and below a seated packer
   b) the annulus between the drill pipe and the surface casing shall remain open to the atmosphere during any disposal operation.
7. Where a second casing string has been run in a well and not cemented to the surface:
   a) the disposal of fluids shall be through the annulus between the casings, provided the surface casing is deeper than 600 metres
   b) the disposal zone shall be identified by depth and geological designation
   c) the fluids to be disposed shall be displaced out of the annulus with a corrosion inhibited fluid. If, after displacement, pressure exists in the annulus, cement shall be displaced into the formation to seal off the disposal interval
   d) the annulus shall be left open to the atmosphere in the manner described in subsection 6.100(2) of the Oil and Gas Conservation Regulations.

8. Where the disposal zone has been cemented behind casing:
   a) the disposal zone shall be identified by depth and geological designation
   b) the casing shall be perforated and the fluids disposed of through the perforations
   c) the perforations shall be appropriately sealed or isolated.
9. When a corrosive fluid such as saltwater is being disposed of, glass reinforced plastic, internally protected steel pipe or other suitably protected corrosion resistant piping materials should be utilized.

8.7.7.3 Surface Water Disposal

When a development requires the discharge of drainage water or surface water runoff from a site there are two levels of jurisdiction that will become involved depending on the project type, size and complexity. These two levels are:

1. Any facility (e.g. gas plants, batteries, in situ facilities) which requires a clean water permit must follow the standards/guidelines from Alberta Environment. The handbook User should refer to a document entitled "Gas Processing Plants - Wastewater Management Standards", September, 1973. The standards document relates to the surface runoff at a production facility such as a gas plant. The main objective of Alberta Environment is to minimize discharge.
2. All other facilities (e.g. single wells) come under the jurisdiction of the ERCB. There are no written requirements available from the ERCB. If the ERCB forsees a problem, special requirements can be made when a well licence is issued.

The land enclosed by a production facility is considered as two sections: plant developed and undeveloped. The plant developed area is that area within the facility boundaries used for storage (e.g. sulphur and condensate) and processing and does not include administration, maintenance, accomodation and areas where sources of potential water contamination are minimal. The surface runoff for these areas can be defined as follows:

1. Undeveloped Areas

   Surface runoff from the undeveloped area shall be controlled by diversion away from the process area of the plant. This runoff may follow the existing natural drainage patterns to the surrounding watershed.

2. Developed Areas

   Surface runoff from the developed area must be controlled and adequately treated before discharging to the surrounding area. The degree of treatment required shall be such that levels of water contaminants in the runoff water released from the treatment facility to the surrounding watershed area do not exceed the values listed in Table 8.7.3.

The surface runoff from the developed area shall be collected and controlled from mixing with runoff from the undeveloped area prior to treatment and monitoring.

Table 8.7.3

STANDARDS OF TREATED SURFACE RUNOFF WATER RELEASED FROM THE DEVELOPED AREA OF CLASS B AND C GAS PLANTS TO WATERSHED AREAS

Water Contaminant or Constituent	Emission Rate or Value	Concentration or Value
Chemical Oxygen Demand	22.7 kg/day	50 mg/l
Suspended Solids (Total)	11.35 kg/day	25 mg/l
Sulfide (Total)	4.54 gr/day	0.1 mg/l
Amonia Nitrogen	2.27 kg/day	5 mg/l
Oil and Grease	2.27 kg/day	5 mg/l
Threshold Odor Number	50 units	50 units
pH	6.5-9.5 units	6.5-9.5 units

Assumptions:

1. Based on 454 m^3 per day discharge.
2. The emission rate of release shall be prorated if the design flow rate of surface runoff varies from 454 m^3 per day.
   a) the developed area of a plant would normally not exceed approximately four hectares (10 acres)
   b) most areas of the province would not exceed a frequency and intensity of precipitation of three inches of rainfall in a 24-hour period on a 25 year return basis
   c) a surface runoff coefficient of 0.15 to 0.20 was assumed for the developed area
   d) the resulting volume of runoff would be retained for a minimum of 24 hours prior to release to the surrounding watershed. On a design basis, the calculations indicated that 454 m^3 of water would be directed to the treatment facilities.

For in situ projects no written guidelines are available from Alberta Environment. However, recommended standards for surface runoff are as follows:

1.	Oil and Grease:	max 10 mg/l
2.	T.S.S.:	max 25 mg/l
3.	pH	6.5-9.5 units

A composite sample consisting of not less than three portions prorated in volume according to the flow rate shall be collected at equal time intervals over a 24-hour period for the purpose monitoring.

The emission rates, values and concentrations shall be based on the flow volume for that 24-hour period during which the composite was collected.

8.7.7.4 Landfilling

Landfilling is the most widely practiced and most economic technique for ultimate disposal of solid and semi-solid waste. Landfilling should not be confused with burial. A landfill is an engineered and preplanned disposal procedure whereas burial is usually an ad hoc response to fill a need for immediate disposal of a waste. Similarly, open dumps still used by some villages and towns are not landfills and are no longer acceptable. With many of the old landfill or burial sites there was no control of the types of wastes being buried. The province has initiated a program known as H.E.L.P. (Help Eliminate Landfill Pollution). The focus of the program is on industrial landfills which are both active and abandoned, and involves all wastes, not just hazardous wastes. For more information on this program the handbook User should contact Alberta Environment, Environmental Protection Services, Pollution Control Division, Waste Management Branch.

The term "sanitary landfill" refers to an operation in which the wastes to be disposed of are compacted and covered with a layer of earth. The frequency of covering depends on the size of the facility. For example, sanitary landfills serving large populations must be covered daily. Sanitary landfills are used for municipal waste disposal and must be covered daily to prevent hatching of flies, rodent infestation, odours and fires. In Alberta, the provincial government is establishing "regional" sanitary landfills to serve several communities and thereby is replacing unacceptable open dumps with a properly operated facility which has been adequately located and engineered.

Sanitary landfills are able to accept certain types of industrial wastes. This requires the approval of the landfill operator.

The term "industrial landfill" refers to an operation which receives industrial wastes and is operated directly by industry or by a contract disposal firm. As for sanitary landfills, these operations must be located, designed and operated so that impacts on the surrounding environment, nearby residents and other adjacent land users are controlled to an acceptable level. Of importance in the location and design of industrial landfills are the following considerations:

1. Type, characteristics and quantity of waste material.
2. Anticipated life of the landfill.
3. Siting should allow a buffer zone to separate the landfill from incompatible adjacent land uses.
4. The landfill area must be underlain by well-compacted clay or a synthetic liner which is compatible with the wastes to be received by the site. Clay liners must be tested for permeability prior to operation.
5. The bottom of the landfill liner must not be in contact with the water table.
6. Surface runoff water must be diverted away from the site.
7. Contamination by leachate migration from the bottom of the landfill should be minimized by prohibiting disposal of toxic and hazardous materials, minimizing or disallowing disposal of liquids, and by installing a leachate detection and/or collection system.
8. Wastes should be periodically covered with earth but the frequency will depend on the local climate and types of waste being disposed of.
9. Wastes which have the potential to create acidic conditions must be intermixed with an appropriate quantity of neutralizing limestone before landfilling. Acidic leachate is a serious concern because of effects on the liner material and because of the ability to mobilize toxic heavy metals.

If on-site disposal is desirable at an oil and gas processing facility, it is essential that proper landfilling procedures be followed. In this way, the potential for future problems will have been minimized or eliminated. When shutdown of a plant eventually occurs, the cleanup and resolution of on-site contamination problems may well be the most costly part of the decommissioning process.

Finally, it is important to recognize that some "Class I Industrial Landfills" provide the maximum protection of the surrounding environment and are designed to receive hazardous or toxic wastes. A class I landfill for these purposes is located at Swan Hills, Alberta. The handbook User should contact Alberta Environment, Pollution Control Division for more information.

Further information available from Standards and Approvals Division, Alberta Environment (427-5883) includes:

1. **Guidelines for Industrial Landfills**
2. **Elements of Engineering Design for a Sanitary Landfill,** Waste Management Series, Publication No. 4.

8.7.7.5 Incineration

Incineration of wastes was used during the 1950s and 1960s for disposal of city wastes, but with the advent of air pollution control regulations in the 1970s most municipal incinerators were shut down. Incineration is once again on the increase because of the potential for energy recovery from hot exhaust gases, short haul distances and improvements in combustion control and air pollution control equipment. The proponent must obtain a licence to operate an incinerator from the Standards and Approvals Division of Alberta Environment.

Incineration of several petroleum industry wastes is attractive because of their heating value content; that is, little or no auxiliary fuel is required. However, uncontrolled burning in flare pits or old drums is often not acceptable since it may cause excessive smoke or ash. Effective incineration must include control combustion air rates, mixing and temperature. The objective is to reduce the waste materials to CO_2 and H_2O to the maximum extent possible. Dust or ash emission should be controlled; as should smoke generation.

An incinerator is a furnace in which waste material is burned. Auxiliary fuel is usually required to ignite the material and, in some cases, to maintain combustion. There are several types of incinerators.

1. single chamber
2. multiple chamber
3. controlled air (starved air or forced air).

Effective combustion requires the proper air/fuel mixture, adequate mixing, sufficient retention time and temperature control.

Further information available on incinerators includes:

1. **Air Curtain Incinerators**

   Information: Provides design guidelines on air curtain incinerators.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

2. **Guidelines for Design and Operation of Refuse Incinerators in Alberta**

   Information: Guidelines on design and operation.

   Available: Alberta Environment, Standards and Approvals Division, Air Quality Branch
   phone: (403) 427-5872.

8.7.7.6 Land Application of Wastes

Many waste materials can be successfully disposed of by controlled addition to, or incorporation into soils. This practice is relatively common in Alberta and includes such wastes as animal manures, municipal sludges and irrigation of municipal and industrial effluents.

There are essentially two types of land treatment systems. One is to apply wastes to land with the intention of growing crops which utilize the water and nutrients in the waste. This is by far the most common and least controversial. In Alberta, almost all land disposal schemes fall in this category. Some petroleum industry wastes have been successfully utilized in this manner (e.g. glycol) and some others may have potential.

A second approach in land application systems is to apply wastes to soils which are deliberately kept barren of vegetation. This practice is frequently referred to as "land farming" but is better described as "land treatment", since there is no plant production. This method is currently being investigated as a disposal technique for oil industry sludges at several experimental sites in Alberta. The basic premise of this technique is to encourage microbial degradation of organic wastes (oils and greases) and to retain undesirable waste constituents such as heavy metals near the surface. Clearly, application rate and site management (optimization of nutrient content, aeration, moisture levels) are critical to the success of such schemes. It is possible that there will be an ultimate metal loading rate restriction placed on such schemes and there may be land-use restrictions on the site when the project is abandoned.

Obviously there are many wastes which do not lend themselves to disposal by either of these techniques. Examples include strong acids and bases, and wastes containing highly toxic or refractory compounds.

In both systems the waste characteristics and rate of application must be such that normal soil processes can still function at a reasonable degree to allow aerobic treatment. For petroleum industry wastes the characteristic which is most likely to preclude the practice or seriously restrict the application rate is the soluble salt content. Soluble salts, especially those containing monovalent cations (i.e. Na, K), are extremely detrimental to soils. The presence of large quantities of any soluble salt alters the osmotic potential of the system; some salts such as chlorides are phytotoxic at relatively low concentrations. Sodium and potassium salts disperse soil colloids causing structural problems which are difficult to rectify.

Approval to dispose of wastes by irrigation or land treatment requires approval from the appropriate regulatory authorities and requires evaluation of the waste material and the proposed site.

For wastewater irrigation projects, the critical variables are likely to be:

1. salt content (specific conductance)
2. sodicity (SAR)
3. pH
4. nutrient content (particularly nitrogen)
5. concentration of other ions (K, Cl, S)
6. heavy metal content.

For land treatment/land farming of concentrated wastes (sludges), the critical variables are likely to be:

1. soluble salt content (NaCl and KCl)
2. organic carbon content (oil and grease)
3. heavy metal content (Hg, Cd, Pb, Ni, Cr and others)
4. total sulphur, total nitrogen, total phosphorus
5. homogeneity of material.

Both wastewater irrigation and land application of sludges require a high degree of management. These techniques have potential for some of our industrial wastes, but people intending to use these approaches should be aware that:

1. There will be a considerable commitment of manpower.
2. There may be final land-use site restrictions.
3. There may be a considerable degree of monitoring – soil and groundwater analyses.
4. In the case of sludge land treatment systems there will probably be an accumulative heavy metal loading restriction.

For further information, the handbook User should contact Alberta Environment.

Also, further information can be obtained from the document:

1. **Land Treatment for the Disposal of Oily Waste Sludges**

   Information: Details on a research project.

   Available: Canadian Petroleum Association
   phone: (403) 269-6721.

8.8 NOISE

The Energy Resources Conservation Board is currently preparing a new directive on noise. This information will be available from the ERCB in 1988. For the status of the new guidelines, contact the ERCB Environment Protection Department.

8.9 EMERGENCY PROCEDURES AND CONTINGENCY PLANS

Section 5.3.1.2 has discussed guidelines regarding spill containment. Section 5.3.9 has discussed guidelines and limitations on gaseous emissions. If there is an unexpected spill, blowout or uncontrollable emission, however, it is essential that the proponent have a contingency or emergency plan to deal with this uncontrolled and unexpected situation.

With well drilling and production facilities, one of the major concerns is a sour gas emission. The Canadian Petroleum Association has prepared two documents entitled:

1. **Guidelines for Preparation of Sour Gas Emergency Procedures Plans for Sour Gas Facilities.**
2. **Guidelines for Preparation of Emergency Procedure Plans for Drilling Completion and Testing of Sour Gas Wells.**

The handbook User should obtain these documents for reference purposes.

Table 8.9.1 is a quick reference which outlines environmental concerns, the location of information within this handbook, and the regulatory contact for each environmental concern.

8.9.1 WELL DRILLING, COMPLETION OR TESTING OF SOUR GAS WELLS

Regarding well drilling, completion or testing, the CPA document (item 2 above) outlines:

1. Regulatory requirements:
    - a) Emergency response plans may be required for any well where the potential H_2S release rate is greater than 0.01 m^3/sec.
    - b) Several government departments must be contacted during preparation of a plan.
2. Level of plan:
    - a) A reduced plan is required where there are four or fewer permanent residences within the emergency planning zone (EPZ). The EPZ is based on H_2S release rate and is defined by the ERCB. For a reduced plan the company should have an internal response plan addressing emergency procedures.
    - b) A normal plan is required where there are many more residences in the EPZ than the reduced plan. An Emergency Procedures Plan as described below is necessary.
    - c) A special plan is required where there are large numbers of people in the EPZ. The special plans go beyond the level of detail required for a normal plan.
3. Local public involvement:
    - a) Discussions should be held with local residents when preparing the Emergency Plan.
    - b) A "Residents Package" should be distributed which outlines the contacts and public concerns.
4. Contents of the Emergency Procedures Plan. The plan should include:
    - a) summary
        - (i) location
        - (ii) size of EPZ
        - (iii) dates for potential hazard
        - (iv) company contact
        - (v) local ERCB office
    - b) emergency definition
        - (i) outline of circumstances causing a sour gas release and action to be taken
        - (ii) stages of alert and action plan
        - (iii) responsibilities of company personnel
        - (iv) responsibilities of government personnel
    - c) evacuation procedures

TABLE 8.9.1

SECTION 8.9 - EMERGENCY PROCEDURES AND CONTINGENCY PLANS ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Spill Containment	5.3.12	- See Appendix C for regional offices of ERCB.
Gaseous Emissions	5.3.9	- Same as above - Alberta Environment Air Quality Branch (427–5893).
Well Drilling, Completion or Testing of Sour Gas Wells (regulatory requirements, level of plan, local public involvement, emergency procedures plan)	8.9.1	- Same as above
Sour Gas Facilities	8.9.2	- Same as above
Spill Response and Contingency Plans	8.9.3	- Same as above
Fish and Wildlife		- Contact Fish and Wildlife (427–6734).
EMERGENCY		- **ALBERTA ENVIRONMENT POLLUTION EMERGENCY RESPONSE TEAM (PERT) EMERGENCY RESPONSE NUMBER (1-800-222-6514)**

    (i) evacuation criteria
    (ii) evacuation plan
    (iii) road blocks
    (iv) evacuation centre
    (v) communications
    (vi) monitoring
    (vii) evacuation notification

d) ignition criteria
    (i) Ignition criteria for each well should be site-specific, based on the particular circumstances of that well.
    (ii) Each plan should describe the procedures to be followed by well site personnel to ignite an uncontrolled flow. This is a hazardous operation and the procedures must recognize the safety of both on-site personnel and the public.

e) post-emergency procedures

f) resident information packages

g) emergency equipment list
    (i) communication equipment
    (ii) field-based equipment
    (iii) detection and control equipment
    (iv) other emergency equipment

h) contact information
    (i) resident contact list
    (ii) company phone numbers
    (iii) government phone numbers
    (iv) other phone numbers

i) maps
    (i) emergency planning zones
    (ii) residents within zones
    (iii) evacuation routes
    (iv) city, town or village limits
    (v) rivers and streams
    (vi) public facilities – rural schools and hospitals, campgrounds and recreational areas
    (vii) major highways and municipal roads, railways
    (viii) locations of other oil and gas operations and any other industries in the area
    (ix) locations of sour gas facilities and ambient air quality monitoring devices (H_2S, SO_2)
    (x) proposed roadblock locations
    (xi) any other information which may be necessary in an emergency situation.

8.9.2 SOUR GAS FACILITIES

The CPA document on emergency procedure plans for sour gas facilities (see section 8.9) covers production facilities. This well drilling, completion and testing document is only concerned with an H_2S emission while drilling. The sour gas facility document deals with producing wells, collection and processing facilities.

The document outlines:

1. Regulatory Requirements

   The proponent should contact the ERCB to determine if an emergency procedure plan is required. Several government agencies should be contacted when preparing the plan. The review of the plan will take up to two months. The plan should be updated annually and simulated exercises using the plan should be implemented to ensure personnel are familiar with the plan.

2. Scope of the Emergency Plan

   The scope can vary depending on the potential impact of the sour gas release.

3. Local Public Involvement

   Local residents should be contacted for input when preparing the emergency procedure plan. Local resident medical problems and transportation requirements should be noted. A resident information package must also be distributed.

4. Contents of the Emergency Procedure Plan

   The plan should consist of:

   a) an introduction which clearly identifies which facilities are covered by the plan, the size of the EPZ and the potential H_2S release rates

   b) an emergency definition and action plan which identifies the different stages or levels of alert and the action necessary

   c) detection and location of a release which describes the various methods by which a release may be detected

   d) definition and isolation of a hazard area. The hazard area depends on the stage of alert

   e) communications procedures between the release site, the company control centre, government agencies and public representatives

   f) evacuation and notification procedures

   g) ignition procedures. In most operating facilities where potential volumes of sour gas are minimized due to emergency shutdown valves and line block valves, ignition of the release is not a primary concern.

      If the gas flow must be ignited, all personnel must be safely clear of the site. The plan must include ignition criteria such as:

      (i) monitoring results indicate instantaneous H_2S concentrations in excess of 20 ppm or the evacuation criteria in unevacuated areas

      (ii) monitoring has not been established and prior determinations indicate a potential exposure of public to H_2S levels sufficient to warrant evacuation

      (iii) the required evacuation has not been completed and events at the emergency site escalate to such a condition that the unevacuated public may be exposed to H_2S levels sufficient to warrant evacuation.

      The plan should indicate that the senior company representative on-site has the authority to have the release ignited and the criteria for deciding to ignite. Ignition procedures should also be described.

   h) control procedures to take control or shut-in the release

   i) responsibilities of company personnel

   j) responsibilities of government agencies

   k) media relations to give personnel direction when dealing with the news media

l) post-emergency procedures to give operating personnel guidance about responsibilities prior to resumption of work

m) procedures to update the plan on an annual basis

n) emergency contact lists

o) a plan showing EPZ for all wells and the collection piping system

p) overall site plan showing area twice the size of the EPZ including all wells, pipelines and facilities.

8.9.3 SPILL RESPONSE AND CONTINGENCY PLANS

In the operation of a production facility, oil, saltwater or liquid waste spills can occur. This section will provide guidelines related to oil and saltwater spills. Section 8.050 of the Oil and Gas Conservation Regulations (AR 151/71) deals with the control of oil and saltwater. Liquid waste spills have been covered in Section 8.7. In addition gaseous emissions have been covered in Section 5.3.9.

The proponent of a well site production facility or pipeline should prepare a spill response plan and a contingency plan. Membership and involvement in the area oil spill cooperative will in part satisfy these requirements. The purpose of the spill response plan is to ensure that the proper control systems are in place to respond to a spill.

The principal objectives of the spill response plan are as follows:

1. Ensure that all personnel have prior knowledge of the surrounding terrain, drainage patterns, road network and the location of residences. An overall site plan of the area showing this information should be prepared.
2. Ensure that all personnel are familiar with implementation monitoring and control procedures. All procedures should be well-documented and staff should be trained.
3. Ensure that the material and equipment required for the containment and recovery of a spill are at hand.
4. Ensure that the ERCB Area Office (see Figure 2.13 and Appendix C) is notified if the spill is not contained on lease or if it is greater than 2 cubic metres. All aspects of the spill and recovery procedures must be documented.
5. Provide information on soil sampling, analysis, restoration and revegetation techniques.

The purpose of the contingency plan is to provide a procedure to handle the spill and the resulting impacts to the environment and public concerns.

Specific information which should be contained in the plan is provided below:

1. The plan should contain concise information to assist operating personnel in the event of a pipeline emergency. The basic requirements are laid out in Section 59 of the Pipeline Regulations.

   The plan should include the following:

   a) a definition of the emergencies covered by the plan

   b) the procedures for handling and investigating leakage reports

   c) the procedure for alerting company personnel and affected outside parties

   d) a clear definition of the responsibilities of everyone involved

   e) guidelines for reaction and control, including shut-down procedures, leak location, leak isolation, spillage containment, watercourse protection, etc.

   f) methods for immediate corrective action including spill control containment, recovery, restoration and rehabilitation of the affected resource

   g) guidelines for the protection of operating personnel and the general public

   h) safe work procedures for pipeline repair

   i) guidelines for post-repair inspection and returning the line to service

j) maps and descriptions of each subsection of the pipeline system, including procedures for isolation and depressurization

k) guidelines for public relations and the dissemination of information

l) a telephone contacts summary.

2. The contingency plans and methods of implementation thereof, should be reviewed and, if necessary, updated at least once per year.
3. The Canadian Petroleum Association's "Alberta Oil Spill Co-operative Contingency Plan " (CPA, 1976) should be made available to each operator.
4. In the event of an oil pipeline rupture, the spill contingency plan must be implemented immediately. By so doing, the affected surface area can be limited and cleanup and soil reclamation procedures implemented. However, these procedures must be developed on a site-specific basis. Any spill over $2m^3$ must be reported to the ERCB, Environment Protection Department.
5. If the pipeline crosses an urban area, a special contingency plan should be developed which will relate to public safety and concerns, and involve the municipal emergency systems where required by the municipal government.

Information available on spill contingency plans includes:

1. **Oil Spill Training Exercise – Guidelines for Inland Waters**

   Information: Document outlines the importance of a contingency plan. Also included is a series of evaluation methods for plans.

   Available: Petroleum Association for Conservation of the Canadian Environment, or Canadian Petroleum Association
   phone: (403) 269-6721.

2. **Guidelines on the Use and Acceptability of Oil Spill Dispersants**

   Information: Outlines oil spill dispersants and how they play a role in an oil spill contingency plan.

   Available: ERCB
   phone: (403) 297-8311.

3. **Fisheries Habitat Protection Guidelines**

   Information: – Oil spill exercises
   – Handling oil spills

   Available: Fish and Wildlife Division, AFLW
   phone: (403) 427-6734.

Numerous documents and courses are available through the Canadian Petroleum Association (CPA) and the Petroleum Industry Training Service (PITS). These documents and courses are as follows:

CPA 1. Guidelines for the Preparation of an Individual Company Oil and Saltwater Spill Contingency Plan
2. Oil Recovery from Under Ice
3. Saltwater Contaminated Soils Reclamation, Parts I and II
4. An Introduction for Field Personnel to the Effects of Oil Spills on Soil and Some General Restoration and Cleanup Procedures
5. Oil Spill Cleanup and Site Reclamation, Edition II
6. Field Manual: Information and Action Regarding Saltwater and Related Spills in Saskatchewan Oil Fields
7. Reclamation of Brine Spills in Upland Boreal Forest Areas, Parts I and II
8. Study Into the Reclamation of Five Oil Spills in Alberta

PITS 1. Oil and Salt Spill Site Rehabilitation Seminar (course manual)
2. Transportation and Spill Response for Dangerous Goods (course)

3. On-scene Spill Commander Course (course)
4. Oil Spill Equipment and Deployment Planning (course)

For more information contact:

Canadian Petroleum Association,
phone: (403) 269-6721.

Petroleum Industry Training Service,
phone: (403) 250-9606.

8.10 ABANDONMENT AND DECOMMISSIONING

Eventually any particular activity will be abandoned or decommissioned. This section provides information on the requirements of abandonment and decommissioning.

Table 8.10.1 is a quick reference which outlines environmental concerns, the location of information within this handbook, and the regulatory contact for each environmental concern.

8.10.1 RECLAMATION ORDERS AND CERTIFICATES

In all cases where a proponent wants to cancel his lease or easement, he will be required to obtain a reclamation order and certificate as required by the Land Surface Conservation and Reclamation Act (see Appendix A1). As a result, Section 8.4 "Reclamation and Conservation" is a very important cross-reference to this Section.

Reclamation orders and certificates are required for seismic operations on Crown land, drilling leases, batteries, gas plants, compressor or pump stations, pipelines, quarry pits and waste disposal or landfill sites.

If the activity is on Crown land which is not a regulated site, then AFLW administers the reclamation order and certificate. If the activity is on patented land or is a regulated site, the reclamation order and certificate is administered by Alberta Environment.

8.10.2 ABANDONMENT

When a well is abandoned the proponent must obtain an "Abandonment of a Well or Formation Approval" (see Table 2.1 and Appendix D) from the ERCB. Well abandonment procedures are specified in Section 3.070 of the Oil and Gas Conservation Regulations (see Appendix A1). In general, when a well is being abandoned, the proponent shall place a cement plug extending from a depth of at least 200 metres to the surface, unless that interval is covered by a casing which is cemented over the interval, but the ERCB may specify the depth of the plug for a specific well or area.

The handbook User should also refer to section 4.0 for more specific information on site completion.

When a production facility is abandoned it is essential that all above-ground equipment and piping is removed. In addition, all buried piping systems should be sealed and locations recorded on "as-built" drawings. All material (e.g. water, oil, gas, etc.) within the piping systems should be displaced and all markers referring to buried pipelines should be removed (API 1975, API 1974). If so directed by the landowner or responsible regulatory agency, remove any access roads to a production facility or drilling lease's site. It is very important to receive direction from the landowner or the responsible regulatory agency for direction on removing or leaving an access road in place. The road area should be recontoured and revegetated to its original state. For the abandonment of a pipeline, the handbook user should refer to part 10 of the Pipeline Regulations (AR 298/75) (see Appendix A1). These regulations describe the procedures that must be followed for the take-up, removal or abandonment of pipelines. It should be noted that consent of the ERCB is required for pipeline abandonment. D & R Approval is also required from the Land Reclamation Division of Alberta Environment for the abandonment of any regulated pipeline. After consent has been obtained, the pipeline section to be abandoned must be:

1. physically isolated or disconnected from any operating facility
2. purged with fresh water, air or inert gas
3. capped at all open ends with moisture-resistent caps.

For information on reclamation procedures and abandonment of roads and seismic lines, the handbook User should refer to Section 8.4.2.

8.10.3 DECOMMISSIONING

Decommissioning guidelines usually relate to larger industrial operations. With respect to the activities in this handbook, gas plants would be a typical activity requiring a decommissioning plan.

TABLE 8.10.1

SECTION 8.10 - ABANDONMENT AND DECOMMISSIONING ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Reclamation Orders and Certificates	8.10.1, 8.4	• For regulated activities see Appendix C for regional offices of Land Surface and Reclamation Countil. • For non-regulated activities contact AFLW (427-3570).
Abandonment	8.10.2	• See Appendix C for regional offices of ERCB.
Abandonment of Well	Table 2.1	• Same as above
Reclamation	8.4.2	• See Appendix C for regional offices of Land Surface and Reclamation Council and Forestry or Public Lands Office of AFLW.
Decommissioning (future land use, definition of the problem, safe containment clean-up plans, waste disposal, verification)	8.10.3	• Same as above • Industrial Wastes Branch of Standards and Approvals Division, Alberta Environment (427-5883).

There is no specific Alberta legislation related to decommissioning or plant site cleanup after decommissioning. In a workshop undertaken in 1985 the Industrial Wastes Branch, Standards and Approvals Division, Alberta Environment outlined the following policy regarding decommissioning:

1. The owner of land on which the plant was operated is responsible for preventing unacceptable future impacts on the environment beyond the site boundary.
2. Contaminants which are left behind at closure of the plant site are not to be present in an amount or form which will preclude productive future use of the site. The categories of use to which the land may revert are residential, agricultural, restricted agricultural, recreation, commercial, and industrial, or it may be returned to its original productive state.
3. Wastes resulting from the cleanup are to be disposed of in such a manner that another problem is not created.
4. Decisions on how a plant site is used must take into consideration the eventual decommissioning of the plant and probable need to clean the site.
5. Local planning authorities should not proceed to approve rezoning applications of industrial plant sites to other uses prior to getting some assurance that the site and prospective use are compatible.
6. The "polluter pays" principle applies and the person responsible for the site contamination is responsible for bearing the cost of cleanup and verification.

When an industrial plant ceases operation, the proponent should provide Alberta Environment with a Decommissioning Plan. This plan should outline:

1. The future land use

   After closure the plant site may be put to productive use. Uses such as residential, agricultural, restricted agricultural, recreational, commercial, or continuing industrial will dictate the extent of cleanup that is required.

2. Definition of the problem

   In addition to well defined sources of contamination such as previously approved waste management facilities (landfills, land farms, wastewater ponds) and product or raw material storage locations where spills may have occurred, there may be some unexpected contamination.

   To assure Alberta Environment that all problem areas on a site have been identified, the proponent should sample all disturbed areas to determine the areal extent of contamination, and the depth of contamination.

3. Safe contaminant concentration definition

   The contaminant concentration above natural background that may remain on the plant site and not create a hazard to the next occupant or to the environment beyond the boundaries of the plant site must be defined. Decisions on safe levels must be supported by information that demonstrates a non-effect impact on:

   a) the occupants of the site
   b) vegetation that will be grown on the site
   c) users of the vegetation grown on the site
   d) local air quality
   e) surface water quality in the short and long term
   f) groundwater quality in the short and long term.

4. Cleanup plan

   A cleanup plan should be developed to address worker safety, impact on neighbors and impact on the environment.

5. Waste disposal options

The regulatory agencies are not receptive to transferring a problem from one place to another. Wastes which are removed must be disposed of in a proper manner, either by treatment or disposal in an industrial landfill. To date, hazardous wastes have been shipped out of the province or have been placed in storage for ultimate disposal at the Swan Hills waste disposal facility.

6. Verification program

Alberta Environment requires that an independent consultant be hired by the proponent to develop and perform a verification which will demonstrate that the decontamination program was successful. This does not imply that all the original work conducted during the problem identification and cleanup execution must be repeated. What is expected is that a random selection of points in contaminated and non-contaminated areas be sampled and analyzed to provide an independent check on the original work.

Alberta Environment has implemented a program which should minimize the problems associated with future plant decommissioning. This program emphasizes better documentation of waste management practices, increased monitoring and surveillance of groundwater and soil impacts, and decision making within the context that the site will someday have to be prepared for another use.

To support applications for operating approval under the Clean Water Act, companies are required to submit a detailed solid waste management plan. This plan is to include information about on-site and off-site storage and disposal of solid waste, design details for on-site facilities, description of groundwater monitoring wells and their locations, and the types and volumes of waste generated annually. Alberta Environment requires that landfills, land farms and ponds be provided with groundwater monitoring wells so that adverse impacts on groundwater can be detected and rectified. There is also a requirement that the monitoring information and information on the type and volume of waste produced annually, and the disposal location be reported every year.

The proponent should also have a record of the types of chemicals that are brought onto the plant site or produced on-site. This information is used to identify the type of contamination to look for when designing the problem identification program.

At the present time, waste disposal practices are being reviewed. Following this review it is likely that restrictions will be imposed for on-site disposal of certain types of hazardous waste. For more information on waste disposal see Section 8.7 and contact the Industrial Wastes Branch, Standards and Approvals Division, Alberta Environment.

The handbook User should also refer to a presentation document entitled "Details of Decommissioning Gas Plants", Monenco Consultants, Calgary. This document is available in the proceedings of the "Workshop on Industrial Site Decommissioning Cleanup and Re-use," October 1985. The proceedings can be obtained from Alberta Environment, Standards and Approvals Division, Industrial Wastes Branch, or Environment Canada.

In addition, another second document of use for reference is:

1. **Guidelines To The Environmental Aspects of Decommissioning Industrial Sites, 3rd Draft**

   Information: Document outlines the purpose, concept and environmental guidelines relevant to decommissioning.

   Available: Environment Protection Programs, Directorate, Environmental Protection Services phone: (403) 427-2739.

8.11 PESTICIDES, HERBICIDES AND CHEMICAL HANDLING

The Agricultural Chemicals Act controls the use of pesticides. The definition of a pesticide according to the act is as follows:

1. Any substance or mixture of substances intended, sold or represented for use in preventing, destroying, repelling or mitigating any insect, nematode, rodent, predatory animal, bacteria, fungus, weed or other form of plant or animal life or virus, except a virus, bacteria or fungus in living man or animals.
2. **Includes** any substance intended for use as a pest control product under the Pest Control Products Act (Canada), plant growth regulator, defoliant or plant desiccant.

Permits are required for application of a herbicide or pesticide (see Appendix D). Permits will be issued to licenced applicators or disposition holders where the total area treated with herbicide, per disposition, is less than one hectare. Where the treated area will exceed one hectare, the only disposition holder will be permitted to obtain the permit.

Application permits will be good for one calendar year and will allow the applicator to treat any disposition as long as the site requires treatment and the treatments are conducted in accordance with the permit conditions.

Pesticide sales and handling, and pesticide application are regulated by two acts:

1. Pesticide Sales, Use and Handling Regulations
2. Pesticide Applicator Licencing Regulations.

Tables 8.11.1 is a quick reference which outlines environmental concerns, the location of information within this handbook, and the regulatory contact for each environmental concern.

8.11.1 APPLICATION OF PESTICIDES

The following procedures should be followed:

1. All chemical application must be made by, or under the supervision of, qualified licenced applicators.
2. There must be no aerial brush spraying under any of the following conditions:
   a) within 30m of the boundary of a municipality, provincial or national park, except where specific permission has been granted
   b) in any urban or resort area
   c) within reasonable distance of a dwelling
   d) on private property, including Indian Reserves, without first obtaining permission
   e) into, on or over an open body of water or within 30m of open water.
3. Any area adjacent to gardens, planted trees or susceptible field crops must be left for either dormant spray (during late fall or winter) or mechanical control.
4. A 15m buffer strip must be left unsprayed wherever a power line or pipeline crosses a numbered highway.
5. Maximum allowable spray heights are as follows:
   a) 2m on any right-of-way that shares a common right-of-way boundary with a numbered highway
   b) 2.6m on any right-of-way that shares a common right-of-way boundary with a paved road, main collector or travelled rural road
   c) 4m on any right-of-way that goes across-country.
6. Soil sterilant herbicides must not be used where a soil erosion problem could result, such as with sandy soils subject to wind erosion or clay soils on steep grades. Soil sterilants are used by the industry for vegetation control around well heads, plant yards, and flare stacks to prevent grass and forest fires. Due to their persistence in the environment, sterilant use is discouraged.

TABLE 8.11.1

SECTION 8.11 - PESTICIDES, HERBICIDES AND CHEMICAL HANDLING ENVIRONMENTAL CONCERNS DIRECTORY

ENVIRONMENTAL CONCERNS	HANDBOOK SECTION LOCATION	CONTACT
Definition of Pesticides and Herbicides	8.11	• Pesticides Chemicals Branch Alberta Environment (427-5855).
Application of Pesticides	8.11.1	• Same as above
Soil Sterilants	8.11.1	• Same as above
Revegetation	8.4.4, 8.4.2.1, 8.5.2.7, 8.11.1	• Same as above
Chemical Handling	8.11.2	• Same as above

Areas which were treated with soil sterilants or which have suffered the impact of a chemical spill present difficult reclamation problems. Fortunately, they are few and small in area.

Revegetation of such sites may, in some cases, be improved by addition of powdered activated charcoal which absorbs the sterilants and chemicals, and hence reduces the toxicity to vegetation. To some degree, the activated charcoal acts like blotting paper by soaking up the sterilant and helping to keep it away from plant roots. Breakdown of sterilants by soil microorganisms does occur but at a rate which is extremely slow, compared to the breakdown of oil. This is because the sterilants tend to be more complex in their organic structure and many of them are directly toxic to the actual soil microorganisms which break down complex organic chemicals.

For further information on spills and cleanup the handbook User should refer to:

1. **Spill Site Reclamation Procedures**
   Information: Recomended prodedures for salt and oil spill cleanup and reclamation.
   Available: Husky Oil Operations Ltd., Lloydminster Division
   phone: (403) 825-1196.
2. **Field Manual for Rehabilitation of Soils Affected by Residual Herbicides**
   Available: Industrial Vegetation Management Association of Alberta.

The Pesticides Chemicals Branch of Alberta Environment has a complete listing of all herbicides and related information on trade names, general use, application rate, mode of action, behaviour and residues in soil, toxicity and method of application.

8.11.2 CHEMICAL HANDLING

Battery operations require the handling, storage and use of a wide variety of process treatment chemicals.

Process materials fall into two broad categories: treatment and corrosion control chemicals.

The treatment chemicals and their active ingredients are as follows:

1.	Demulsifiers, Friction Reducers, Surfactants and Pad Breakers	may contain methyl alcohol, isopropanol surfactants, glycols, alkylated phenol formaldehyde resins, aromatic hydrocarbons, salt for water treatment and dispersants.

The corrosion control chemicals are:

1.	Corrosion Inhibitors	may contain amines, methyl alcohol, surfactants, sulphites, isopropanols, caustics.
2.	Biocides	may contain formaldehyde, methyl alcohol, isopropanol, gluteraldehyde, glycols, quatenary ammoniums and other unspecified surfactants and components (also includes chlorine).
3.	Oxygen Scavangers	contain sulphites, methyl alcohols, glycols, isopropanols.
4.	Scale Inhibitors	phosphonates (usually low pH).

At wellhead operations and pipeline facilities, many operations require the injection of treatment chemicals into the line. When this treatment is continued on a permanent basis, it should be achieved by direct injection into the system from a bulk tank (ie. 45 gallon drum).

At compressor stations, odorizing chemicals (Mercaptan) are injected into the product pipeline. Injection of the chemical should be the same as above.

To store the chemicals the following recommendations are suggested:

1. Bulk tanks should be used for storage whenever treatment/corrosion chemicals are routinely added to process lines, regardless of volumes consumed. The volume consumed determines the size of the tank but it is likely 45 gallon drums would be in order.

2. All tanks should be fitted with an external gauge to monitor content level. The tank must be externally vented if located in a building.
3. All metal storage/bulk tanks and/or frames should be electrically grounded.
4. Tanks larger than 50 gallons should be dyked or an equally effective means identified to prevent excessive contamination to the surrounding area in the event of a major spill or tank fracture.
5. Bulk/storage tanks should be clearly labelled to identify contents in compliance with workplace Hazardous Materials Information System (WHMIS). Labelling is required by product name and/or number as well as type (ie. biocide, demulsifier, etc.), and colour coded, where practical.
6. When wall mounted drums (45 gallon) are used as bulk tanks, the refilling process should be carried out using a barrel transfer pump. The barrel pump construction should be suitable for use with the specific chemical. Barrel pumps and both containers involved in the transfer should be grounded.
7. The refilling of all bulk/storage tanks should be the responsibility of the supplier.
8. All ladders, stairs, and platforms for bulk/storage tanks must be in accordance with all applicable company and legislated standards.

Chemical metering pumps are essential to control chemical usage. The following recommendations should be addressed:

1. Chemical metering pumps should be clearly labelled by chemical name and/or number.
2. All chemical lines should be colour coded and/or labelled at both ends.
3. When chemical lines are piped to an injection pot, the line should extend below a splash guard/screen inside the pot.
4. If a chemical must be manually added to a chemical pot, the pot should be fitted with a splash screen and a lid.
5. Chemical metering equipment should be located in a well-ventilated area, preferably serviced by mechanical ventilation.

Manual handling of chemicals must be actively discouraged. The transportation of chemicals or empty chemical containers inside vehicles must be avoided. Open top trucks or the equivalent should be used when transporting chemicals. If a non-routine manual chemical treatment is required then workers are required to:

1. Wear full personal protective equipment specific to the particular chemical being handled. A respirator and Class I rubber boots may be necessary as defined by the Material Safety Data Sheet (MSDS).
2. Use pails with tight fitting lids.
3. Chemical drums or pails must be secured and sealed to prevent spillage during vehicle transport.
4. Empty Mercaptan drums should be neutralized with household bleach and rinsed out with water prior to storage/removal.

Also note that common materials such as paint thinners and solvents are to be treated as chemicals and the same precautions must be observed.

All chemical usage should be manifested. Manifest data sheets should be reviewed frequently by all personnel and the facility supervisor. In additon the safety data sheets (MSDS) on each chemical should be prominently and frequently displayed where the chemicals are used.

Regarding personal protective equipment, equipment appropriate to the specific work involved must be readily available and used at each work station where chemicals are handled. These should include face shield, goggles, gloves, and apron suitable for the chemicals being handled. Respirators, rubber pants, and Class I rubber boots may be necessary as defined by the specific MSDS.

Equipment should also be stored in the operators' vehicles and transported to individual sites as required. The equipment must be cleaned of any chemical spills after use and prior to storage.

Suitable respiratory protective equipment should be readily available and used when toxic or volatile chemicals have been identified in a product. A cartridge respirator fitted with an organic vapour cartridge may be necessary for handling certain chemicals as noted on the MSDS. A code of practice for the selection, use and maintenance of respiratory protective equipment must be readily available at each location where respirators are stored for use.

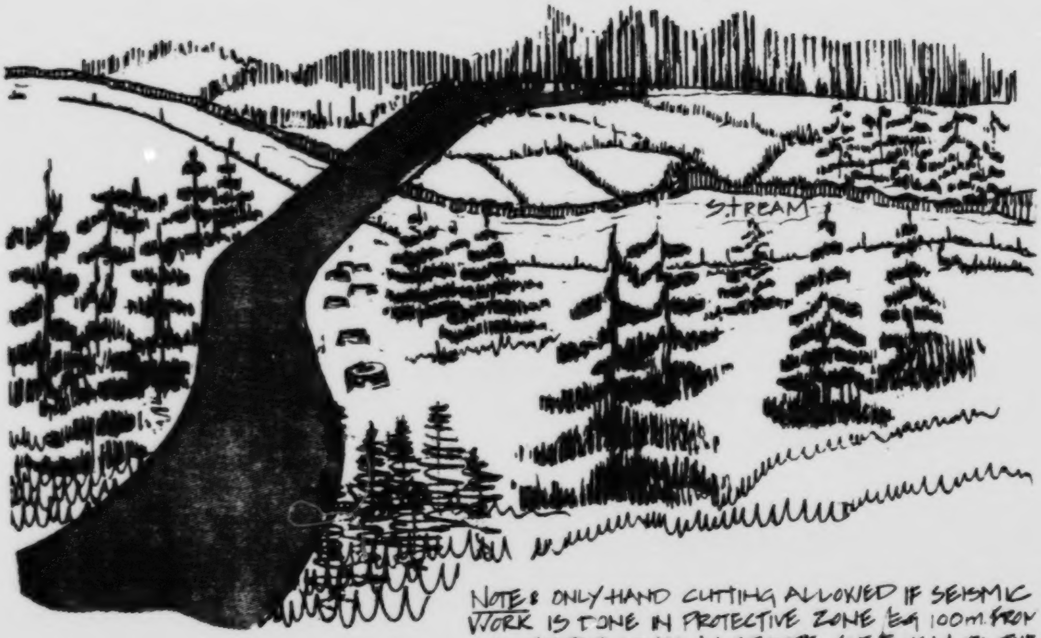
First Aid kits should also be available at all locations where chemicals are handled. At remote locations the kit should be stored in the operator's truck. In addition, eyewash and shower facilities must be readily available. When designing chemical usage facilities the design team should consult with the Department of Community and Occupational Health (phone 427-0199).

8.12 ENVIRONMENTAL AUDIT

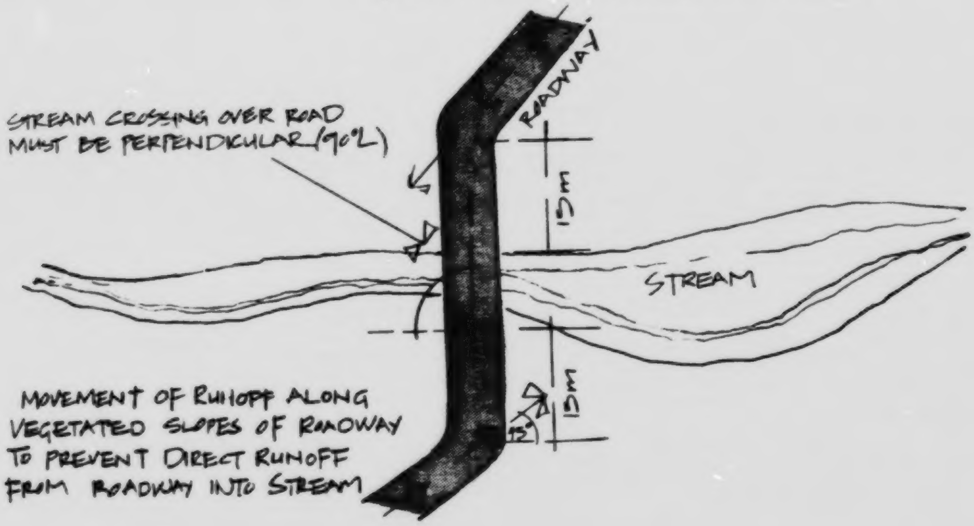
TO BE ADDRESSED IN FUTURE UPDATES

8.13 PUBLIC PARTICIPATION

TO BE ADDRESSED IN FUTURE UPDATES



NOTE: ONLY HAND CUTTING ALLOWED IF SEISMIC WORK IS DONE IN PROTECTIVE ZONE (EG 100m FROM HIGH WATER LEVEL) & STUMPS CUT FLUSH TO THE GROUND ALLOWING VEHICLES INTO AREA.



STREAM CROSSING OVER ROAD MUST BE PERPENDICULAR (90°L)

MOVEMENT OF RUNOFF ALONG VEGETATED SLOPES OF ROADWAY TO PREVENT DIRECT RUNOFF FROM ROADWAY INTO STREAM

Figure 8.1.1 DOG-LEGGED STREAM CROSSING APPROACH

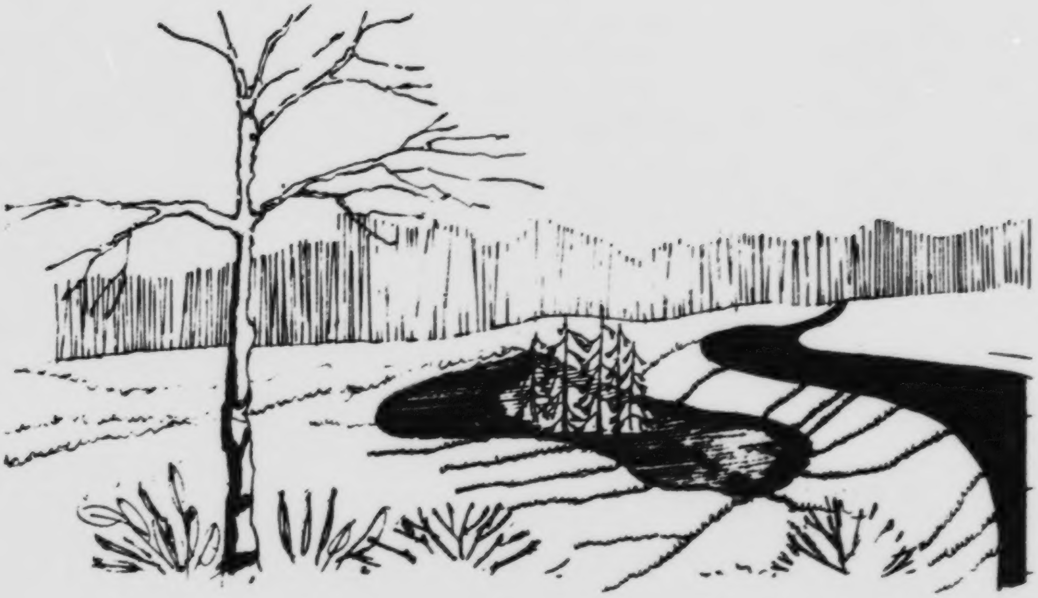


Figure 8.1.2 INADEQUATE DRAINAGE HAS CAUSED THE WATER LEVEL IN THE SWAMP TO RISE AND DROWN A LARGE NUMBER OF TREES

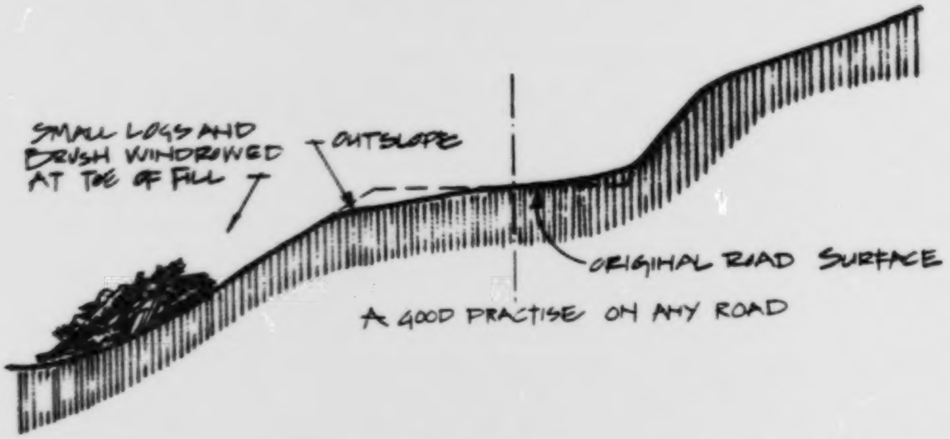

SMALL LOGS AND
BRUSH WINDROWED
AT TOE OF FILL
OUTSLOPE
ORIGINAL ROAD SURFACE
A GOOD PRACTISE ON ANY ROAD

Figure 8.1.3 OUTSLOPING OF ROAD FOR PROPER DRAINAGE

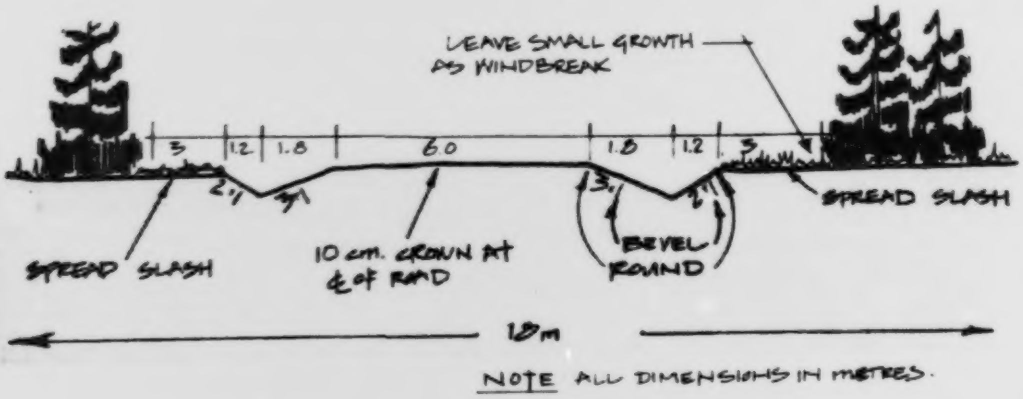

LEAVE SMALL GROWTH
AS WINDBREAK
3
1.2
1.8
6.0
1.8
1.2
3
2:1
3:1
3:1
2:1
SPREAD SLASH
10 cm. CROWN AT
℄ OF ROAD
BEVEL
ROUND
SPREAD SLASH
18m
NOTE ALL DIMENSIONS IN METRES.

Figure 8.1.4 DETAIL OF ROAD AND BRUSH PLAIN CROSS-SECTION

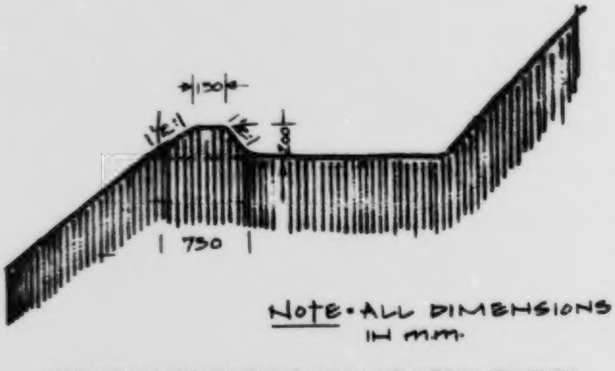

150
1½:1
1½:1
300
750
NOTE • ALL DIMENSIONS
IN mm.

Figure 8.1.5 BERMS USED FOR DRAINAGE STRUCTURES

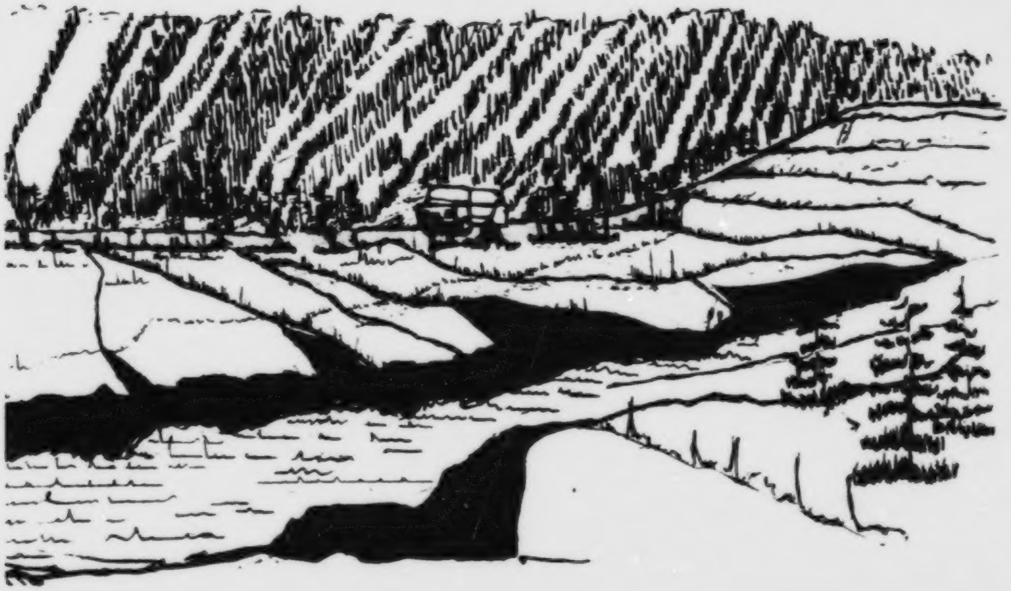


Figure 8.1.6 THIS GULLY HAS ERODED AFTER AN INTERMITTENT STREAM WAS DIVERTED WITHOUT CONSIDERATION OF EROSION CONTROL REQUIREMENTS.

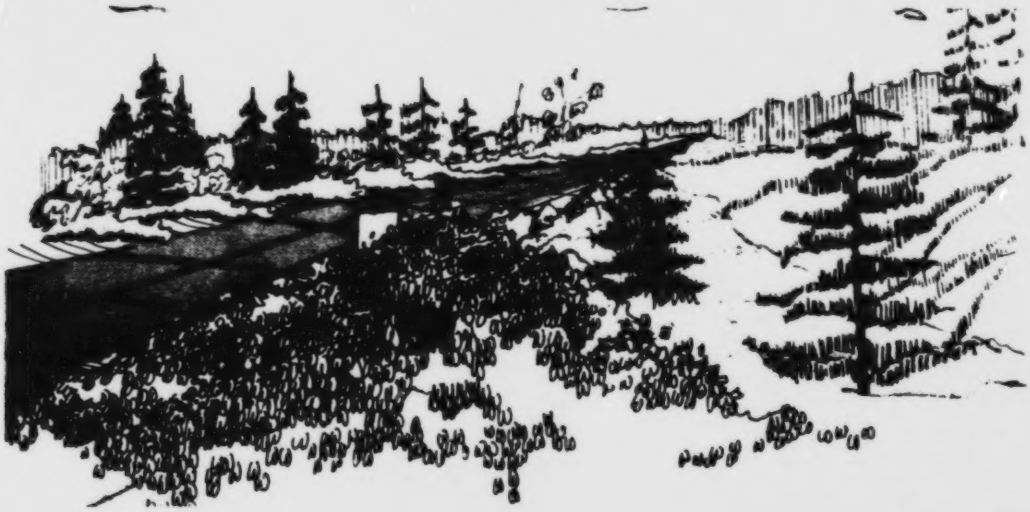
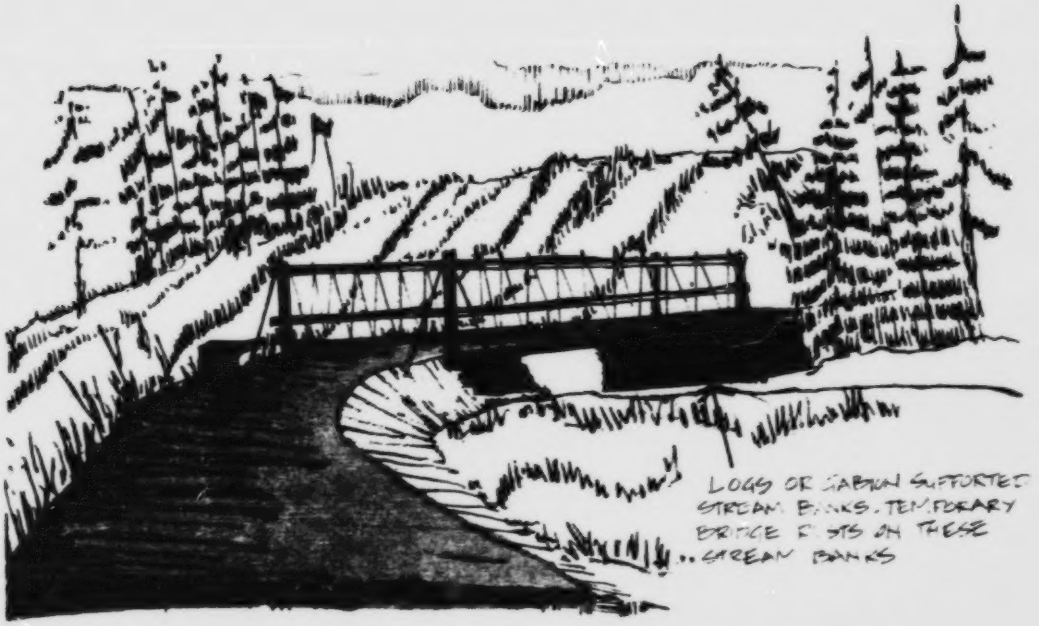


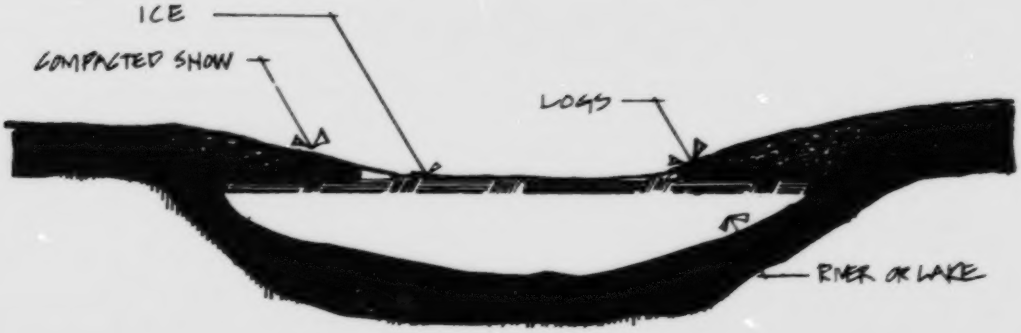
Figure 8.1.7 BRUSH HAS ENCROACHED UPON ROADWAY, HIDING ROADSIGNS AND REDUCING SIGHT DISTANCES. ROUTINE ROADSIDE MAINTENANCE WOULD PREVENT THIS AND IMPROVE AESTHETICS



LOGS OR GABION SUPPORTED STREAM BANKS. TEMPORARY BRIDGE RESTS ON THESE STREAM BANKS

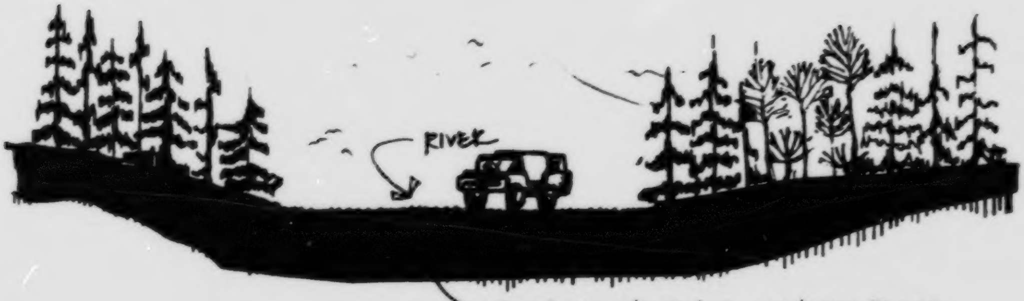
Figure 8.2.1 **TEMPORARY BRIDGE CROSSING WITH WIDE SPAN TO FACILITATE PASSAGE OF DEBRIS**

NOTE: THICKNESS OF ICE DEPENDS ON WEIGHT OF EQUIPMENT. A SPECIALIST SHOULD BE CONSULTED.


ICE
COMPACTED SNOW
LOGS
RIVER OR LAKE

CHANNEL MUST BE OPEN UNDER ICE TO ALLOW FOR PASSAGE OF FISH

Figure 8.2.2 **ICE BRIDGE**



BOTTOM OF RIVER MUST BE FIRM ENOUGH TO ALLOW SAFE CROSSING OF VEHICLES

Figure 8.2.3 **TYPICAL FORD LOCATION**

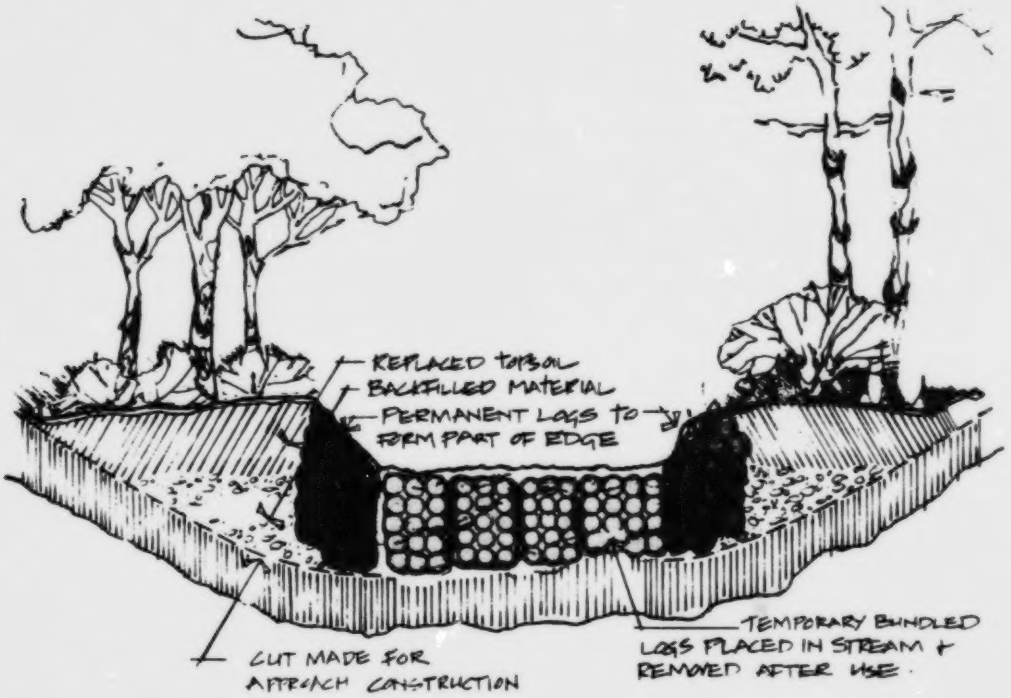

REPLACED TOPSOIL
BACKFILLED MATERIAL
PERMANENT LOGS TO FORM PART OF EDGE
TEMPORARY BUNDLED LOGS PLACED IN STREAM + REMOVED AFTER USE.
CUT MADE FOR APPROACH CONSTRUCTION

Figure 8.2.4 LOG FILL INSTALLATION

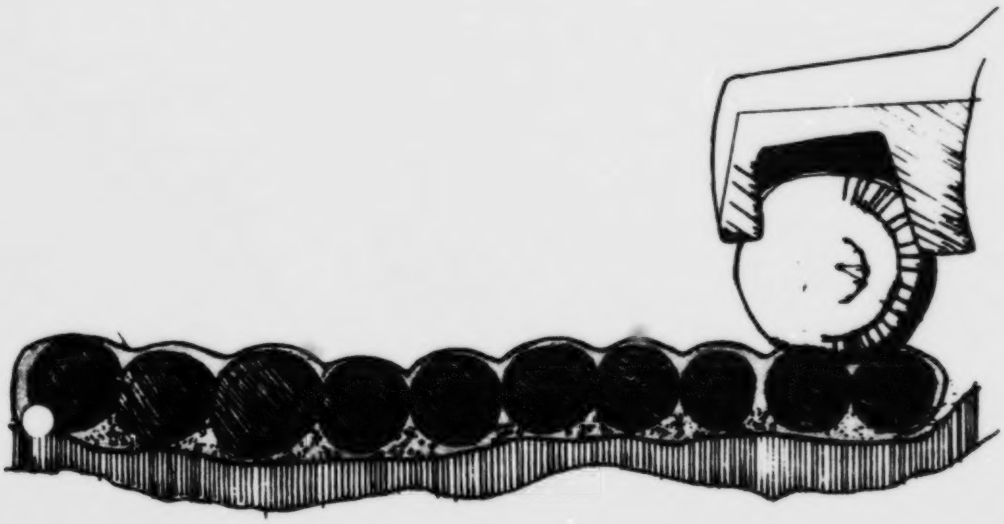


Figure 8.2.5 CORDUROY ROADS

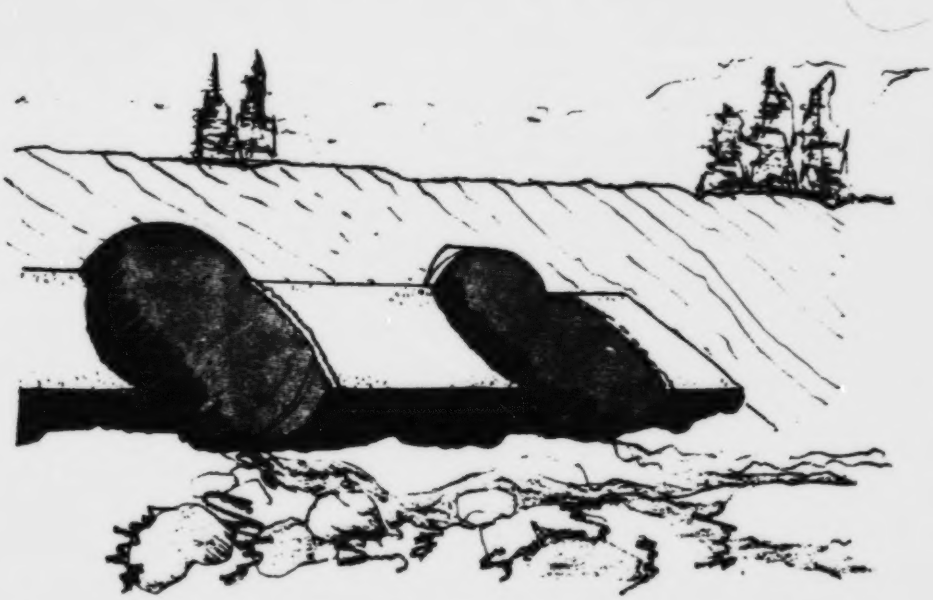


Figure 8.2.6 THIS CULVERT HAS BEEN PLACED AND IS ADEQUATELY PROTECTED WITH CONCRETE APRON.

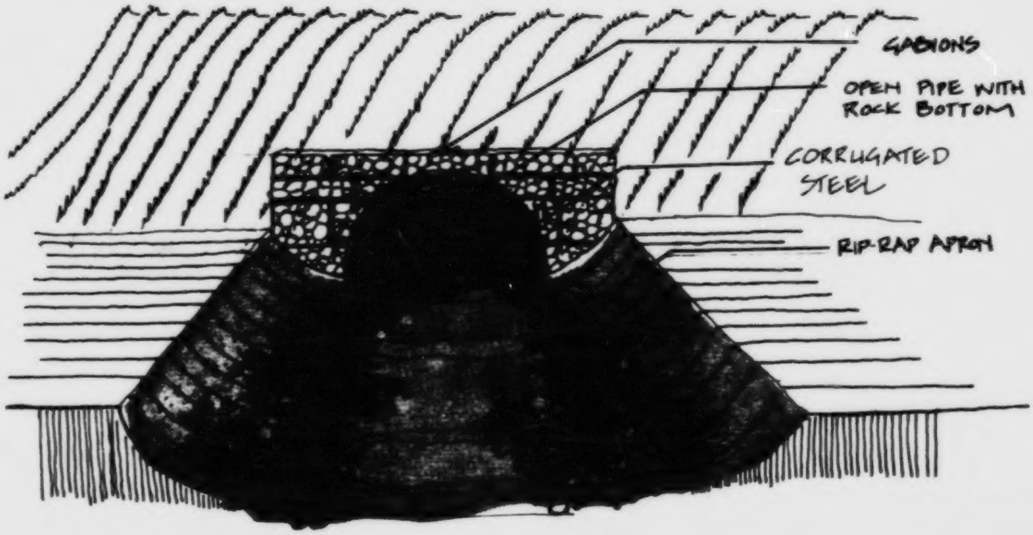

GABIONS
OPEN PIPE WITH ROCK BOTTOM
CORRUGATED STEEL
RIP-RAP APRON

Figure 8.2.7 ARCH CULVERT

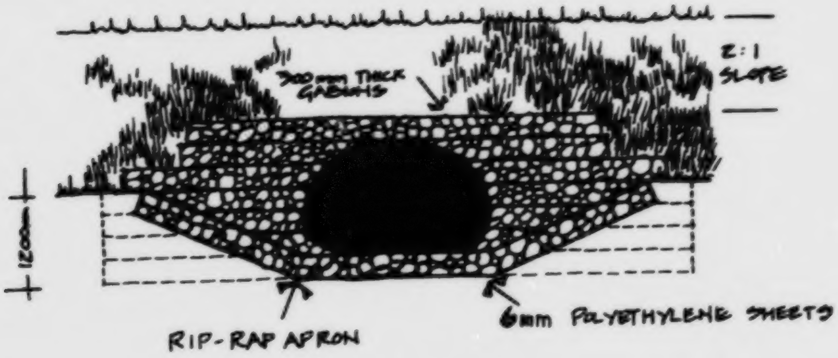

300 mm THICK GABIONS
2:1 SLOPE
1200mm
RIP-RAP APRON
6mm POLYETHYLENE SHEETS

Figure 8.2.8 HORIZONTAL ELIPTICAL CULVERT

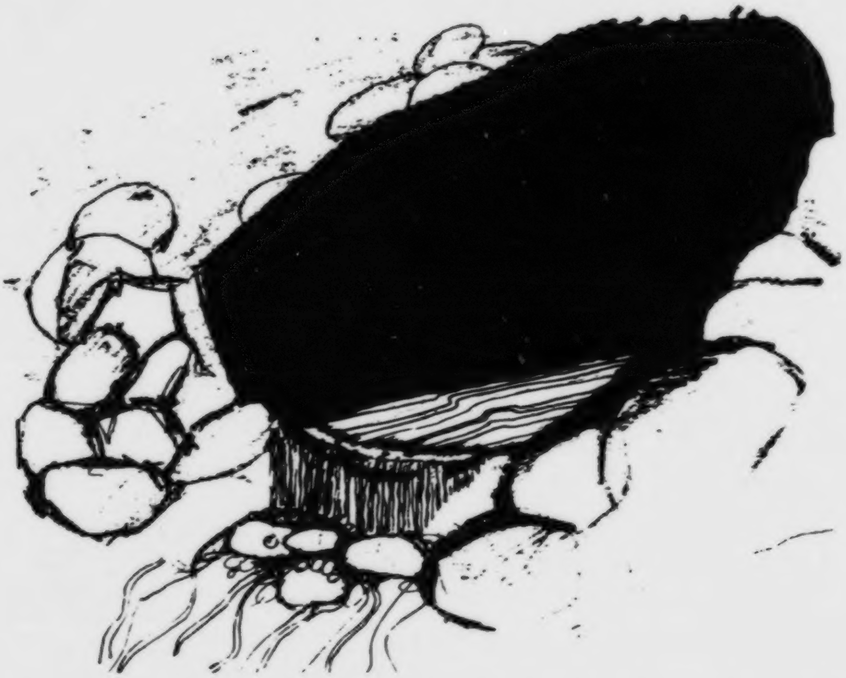


Figure 8.2.9 FISH OBSTRUCTION WHEN CULVERT INVERTS ARE INSTALLED ABOVE THE HORIZONTAL STREAM BED

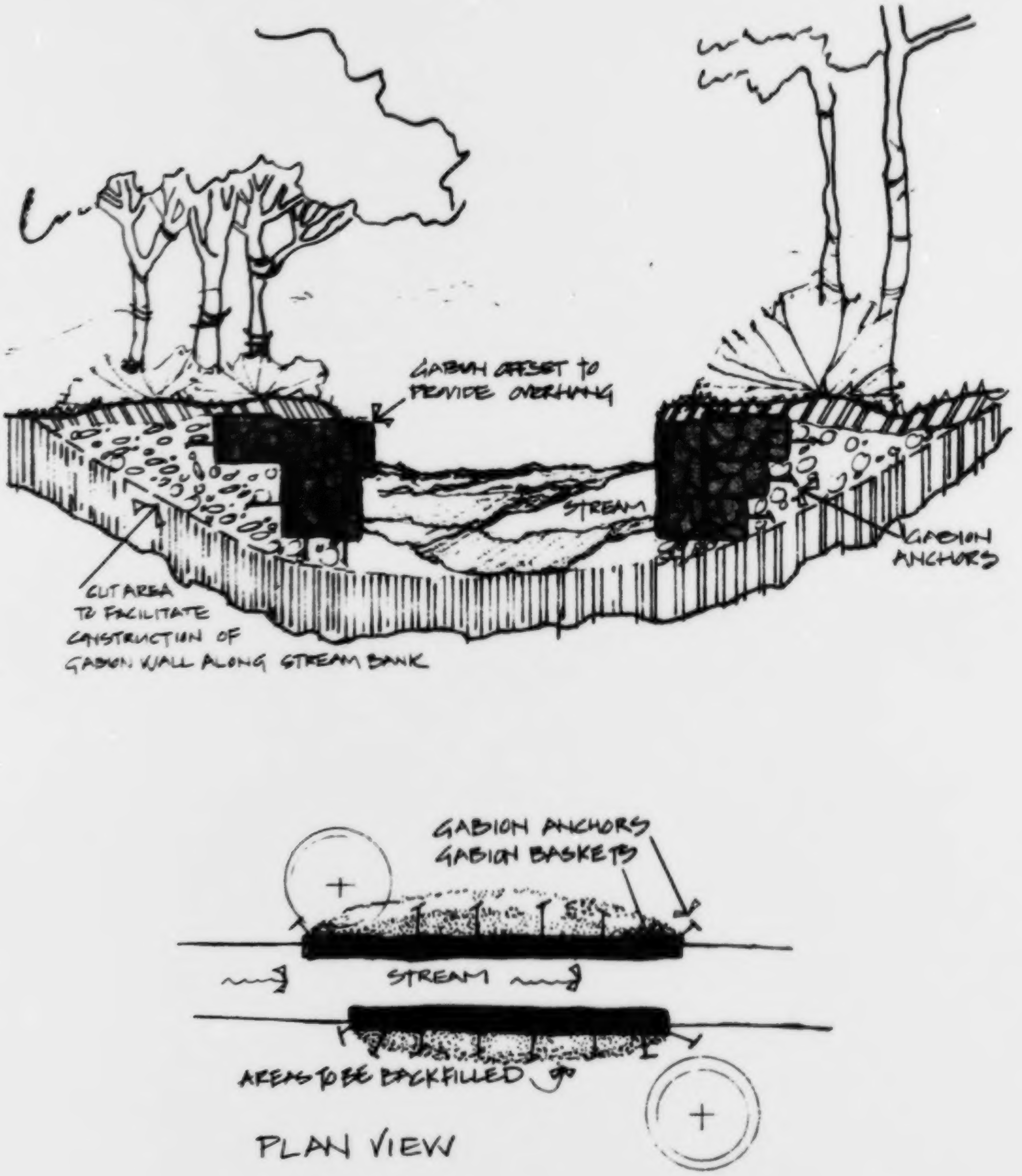

GABION OFFSET TO PROVIDE OVERHANG
STREAM
GABION ANCHORS
CUT AREA TO FACILITATE CONSTRUCTION OF GABION WALL ALONG STREAM BANK
GABION ANCHORS
GABION BASKETS
STREAM
AREAS TO BE BACKFILLED
PLAN VIEW

Figure 8.2.10 **RESTORATION OF HABITAT BY RECONSTRUCTION OF OVERHANGING BANKS AND RE-ESTABLISHMENT OF VEGETATION AND SHADE COVER**

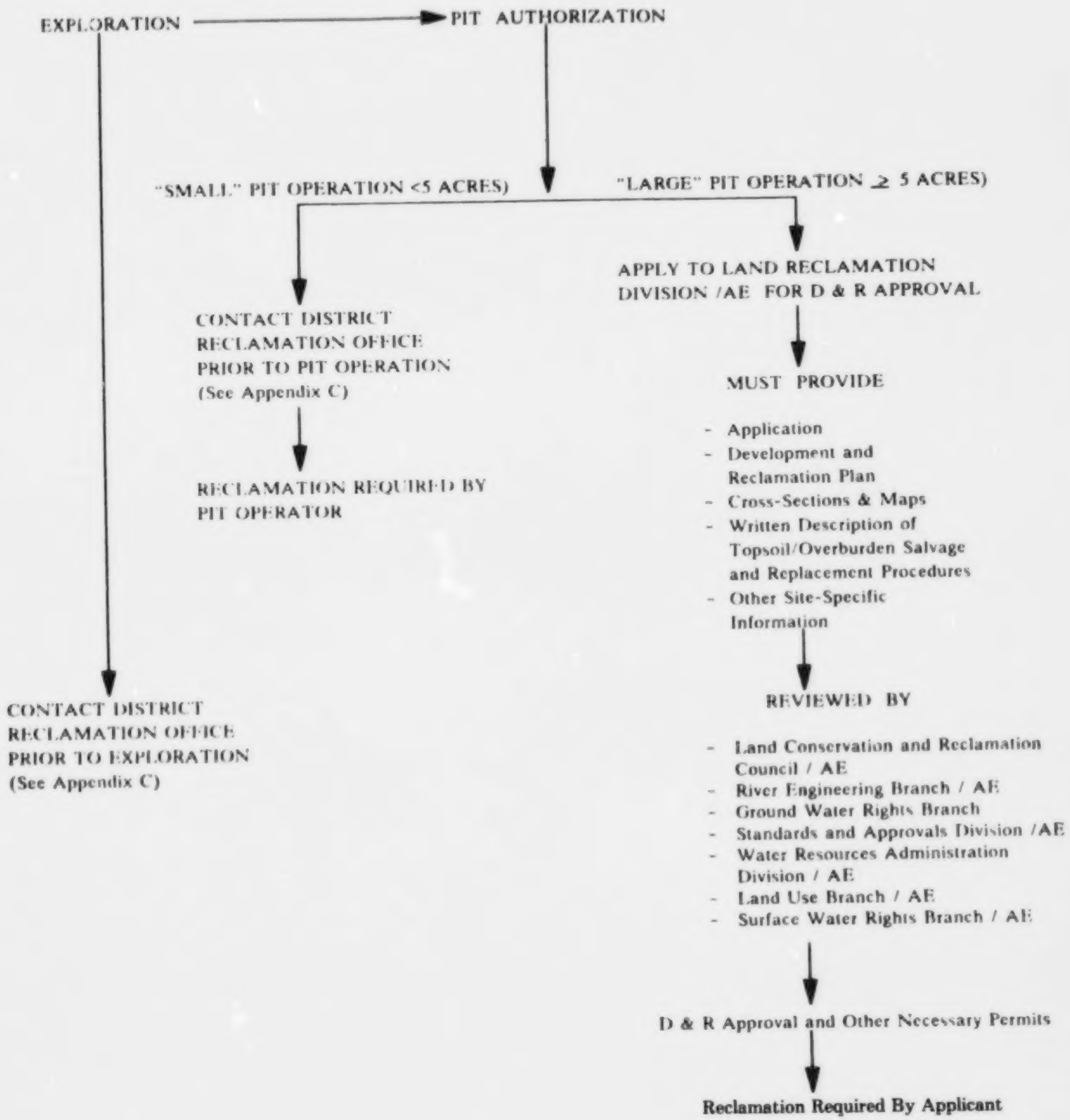

EXPLORATION
PIT AUTHORIZATION
"SMALL" PIT OPERATION <5 ACRES)
"LARGE" PIT OPERATION ≥ 5 ACRES)
APPLY TO LAND RECLAMATION DIVISION /AE FOR D & R APPROVAL
CONTACT DISTRICT RECLAMATION OFFICE PRIOR TO PIT OPERATION (See Appendix C)
MUST PROVIDE
- Application
- Development and Reclamation Plan
- Cross-Sections & Maps
- Written Description of Topsoil/Overburden Salvage and Replacement Procedures
- Other Site-Specific Information
RECLAMATION REQUIRED BY PIT OPERATOR
REVIEWED BY
- Land Conservation and Reclamation Council / AE
- River Engineering Branch / AE
- Ground Water Rights Branch
- Standards and Approvals Division /AE
- Water Resources Administration Division / AE
- Land Use Branch / AE
- Surface Water Rights Branch / AE
CONTACT DISTRICT RECLAMATION OFFICE PRIOR TO EXPLORATION (See Appendix C)
D & R Approval and Other Necessary Permits
Reclamation Required By Applicant

Figure 8.3.1

SURFACE MATERIALS ON PATENT LANDS
APPLICATION PROCEDURES
(Reference: A.F.L.W. and A.E.)

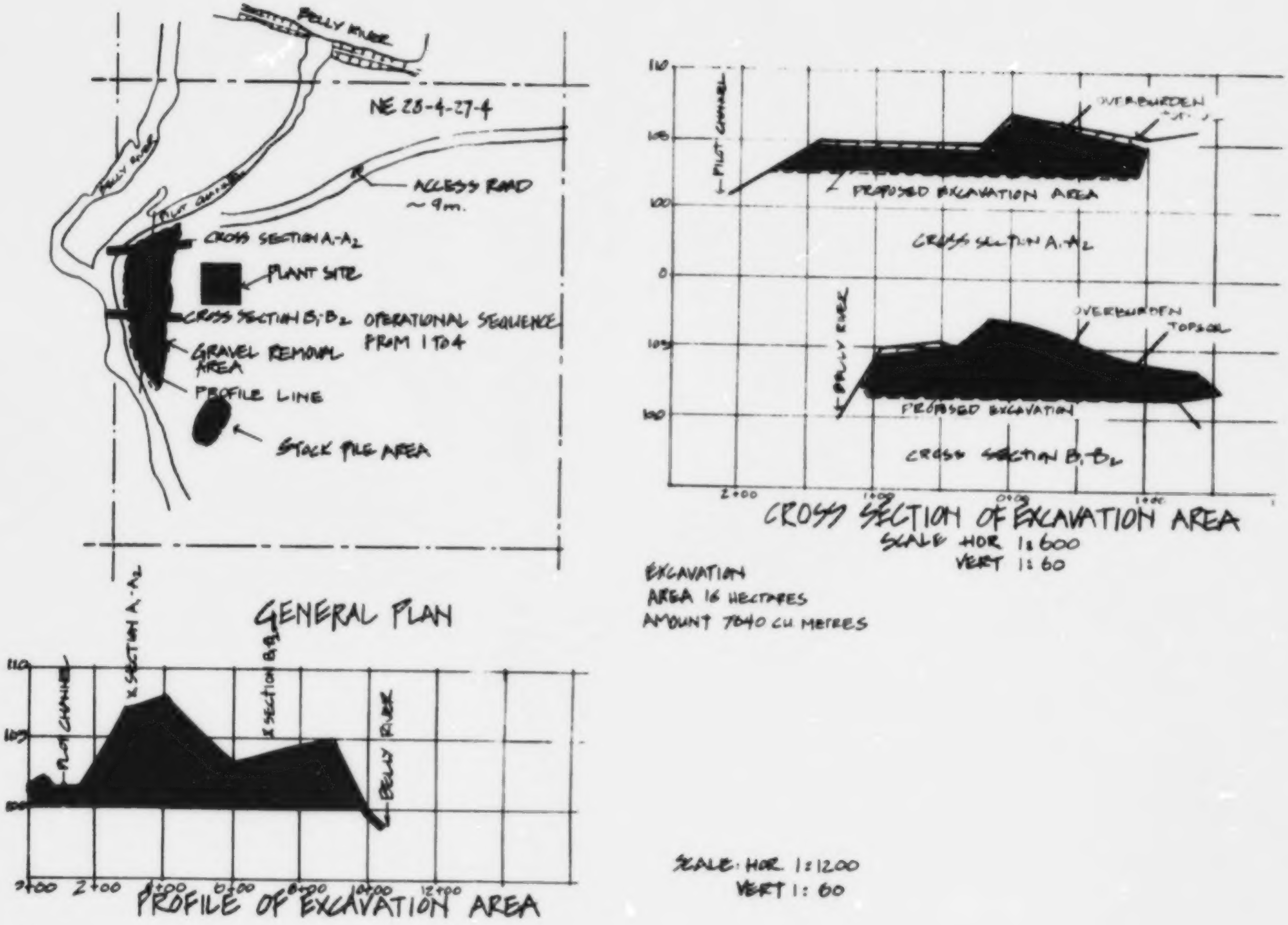

BELLY RIVER
NE 28-4-27-4
ACCESS ROAD ~ 9m.
PILOT CHANNEL
CROSS SECTION A1-A2
PLANT SITE
CROSS SECTION B1-B2
OPERATIONAL SEQUENCE FROM 1 TO 4
GRAVEL REMOVAL AREA
PROFILE LINE
STOCK PILE AREA
GENERAL PLAN
110
105
100
X SECTION A1-A2
X SECTION B1-B2
2+00
4+00
6+00
8+00
10+00
12+00
PROFILE OF EXCAVATION AREA
SCALE: HOR 1:1200
VERT 1:60
OVERBURDEN
PROPOSED EXCAVATION AREA
CROSS SECTION A1-A2
0
TOPSOIL
PROPOSED EXCAVATION
CROSS SECTION B1-B2
1+00
0+00
CROSS SECTION OF EXCAVATION AREA
SCALE HOR 1:600
VERT 1:60
EXCAVATION
AREA 16 HECTARES
AMOUNT 7040 CU METRES

Figure 8.3.2 TYPICAL DRAWING SHOWING GENERAL PLAN, CROSS-SECTION OF EXCAVATION AREA AND PROFILE

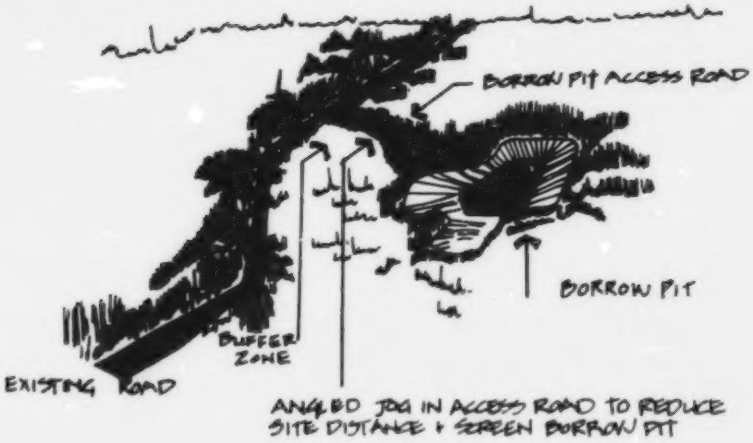

BORROW PIT ACCESS ROAD
BORROW PIT
BUFFER ZONE
EXISTING ROAD
ANGLED JOG IN ACCESS ROAD TO REDUCE SITE DISTANCE + SCREEN BORROW PIT

Figure 8.3.3 BUFFER OF WINDFIRM TREES LEFT BETWEEN BORROW PIT AND RIGHT-OF-WAY FOR ROADS

Division of Relaxed And Partial Disposal Areas

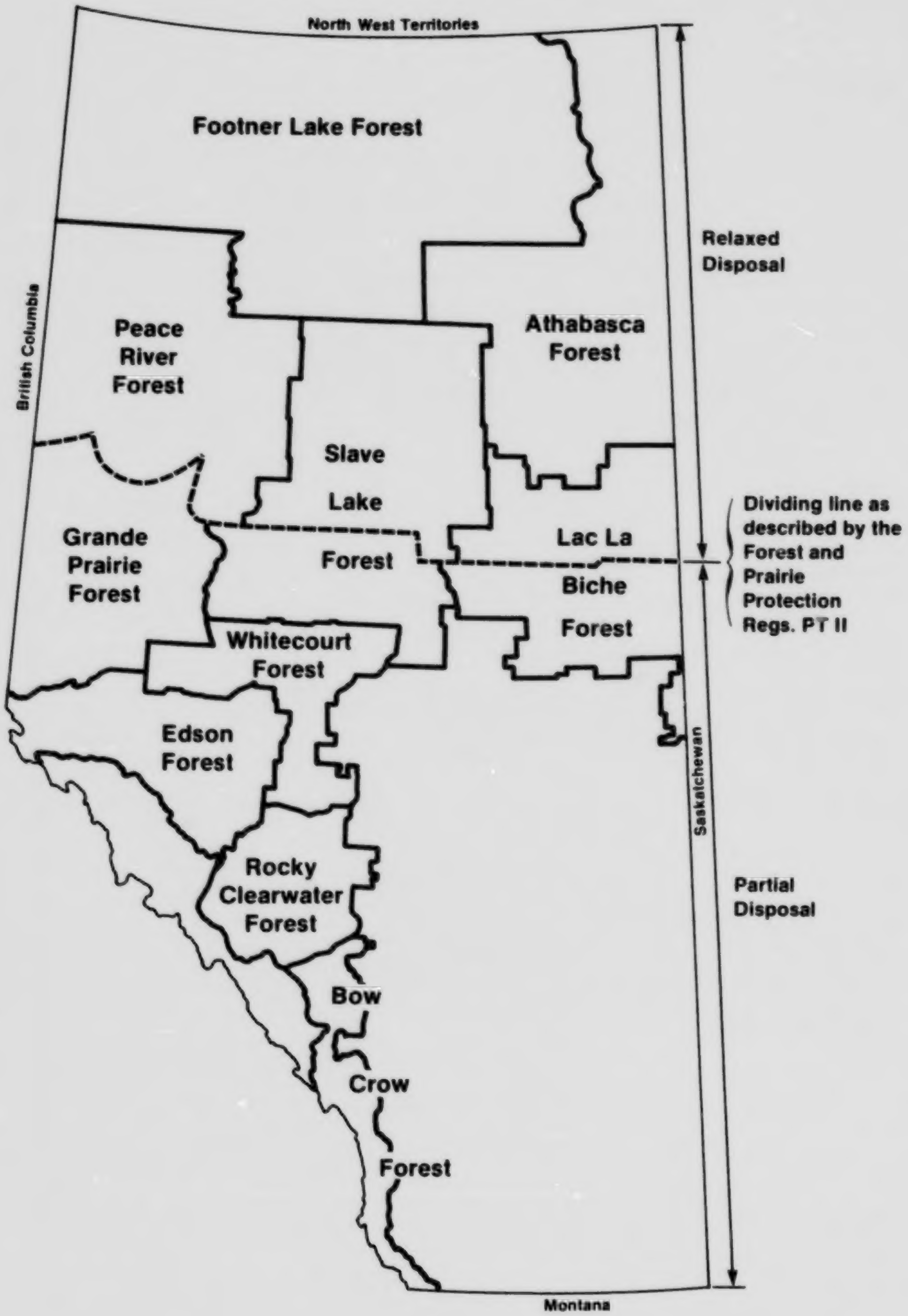

North West Territories
Footner Lake Forest
Relaxed Disposal
British Columbia
Peace River Forest
Athabasca Forest
Slave Lake Forest
Grande Prairie Forest
Lac La Biche Forest
Dividing line as described by the Forest and Prairie Protection Regs. PT II
Whitecourt Forest
Edson Forest
Saskatchewan
Rocky Clearwater Forest
Partial Disposal
Bow Crow Forest
Montana

Figure 8.4.1

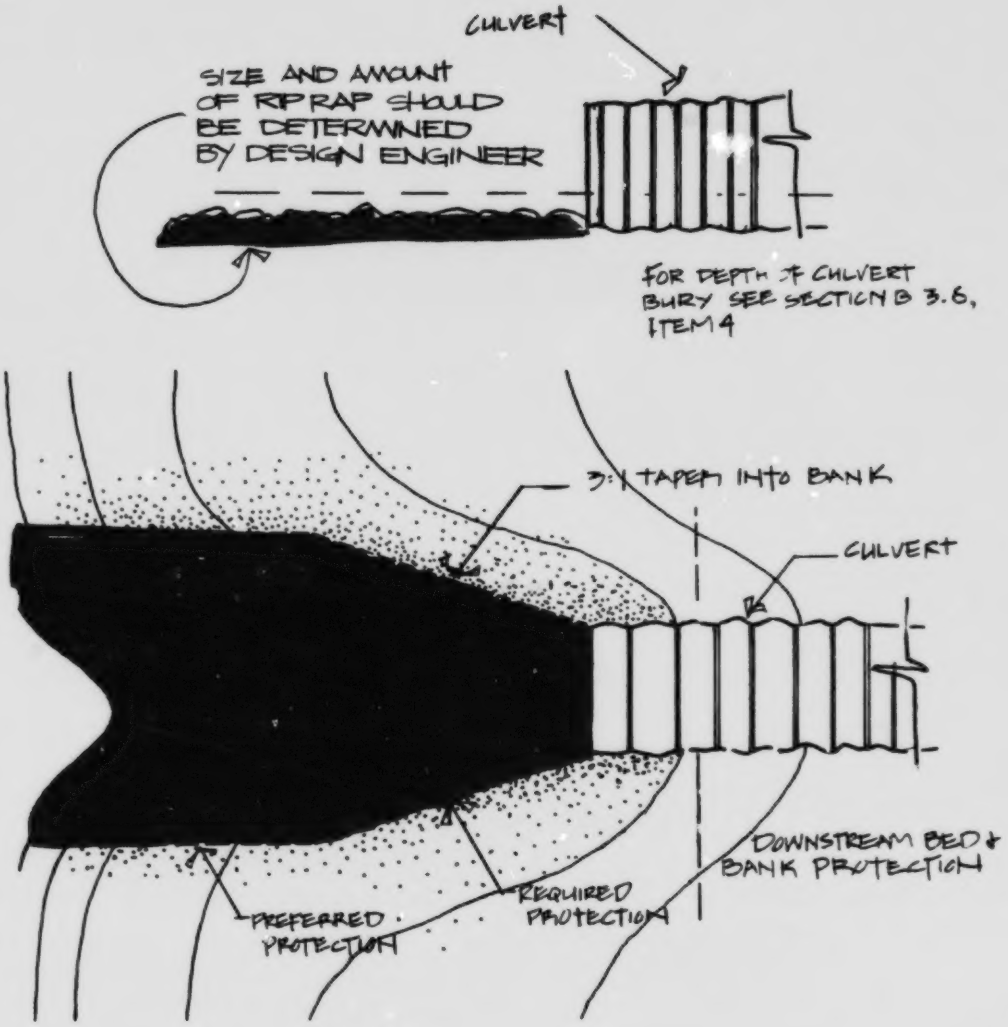

CULVERT
SIZE AND AMOUNT OF RIP RAP SHOULD BE DETERMINED BY DESIGN ENGINEER
FOR DEPTH OF CULVERT BURY SEE SECTION B 3.6, ITEM 4
3:1 TAPER INTO BANK
CULVERT
DOWNSTREAM BED & BANK PROTECTION
REQUIRED PROTECTION
PREFERRED PROTECTION

Figure 8.5.1 **PLACEMENT OF RIP-RAP ON APRONS AT EXIT AND ENTRANCE TO CULVERT**

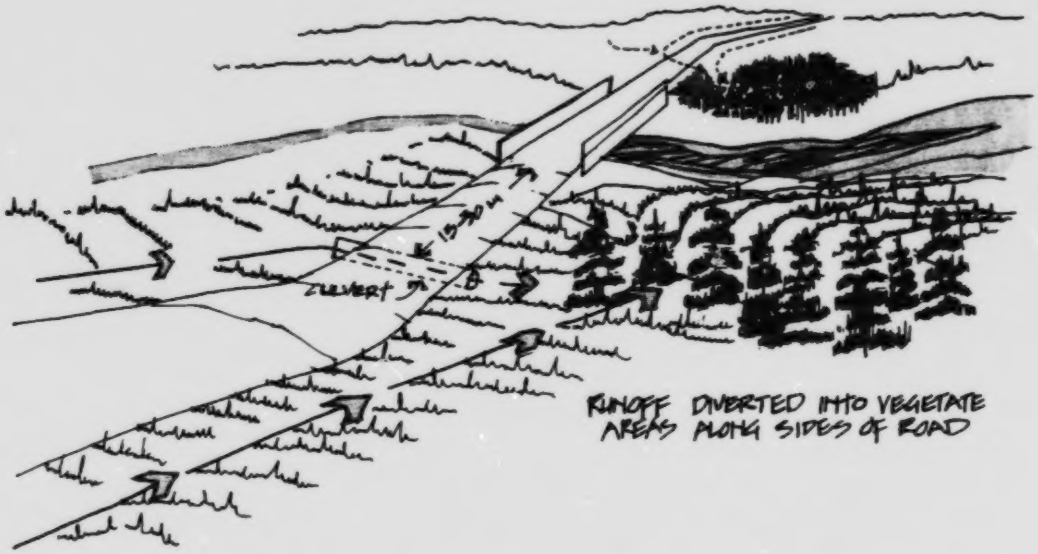

15-30 m
CULVERT
RUNOFF DIVERTED INTO VEGETATE AREAS ALONG SIDES OF ROAD

Figure 8.5.2 CULVERT TO DIVERT SILT LADEN WATERS AWAY FROM STREAMS INTO MORE STABLE FOREST COVER

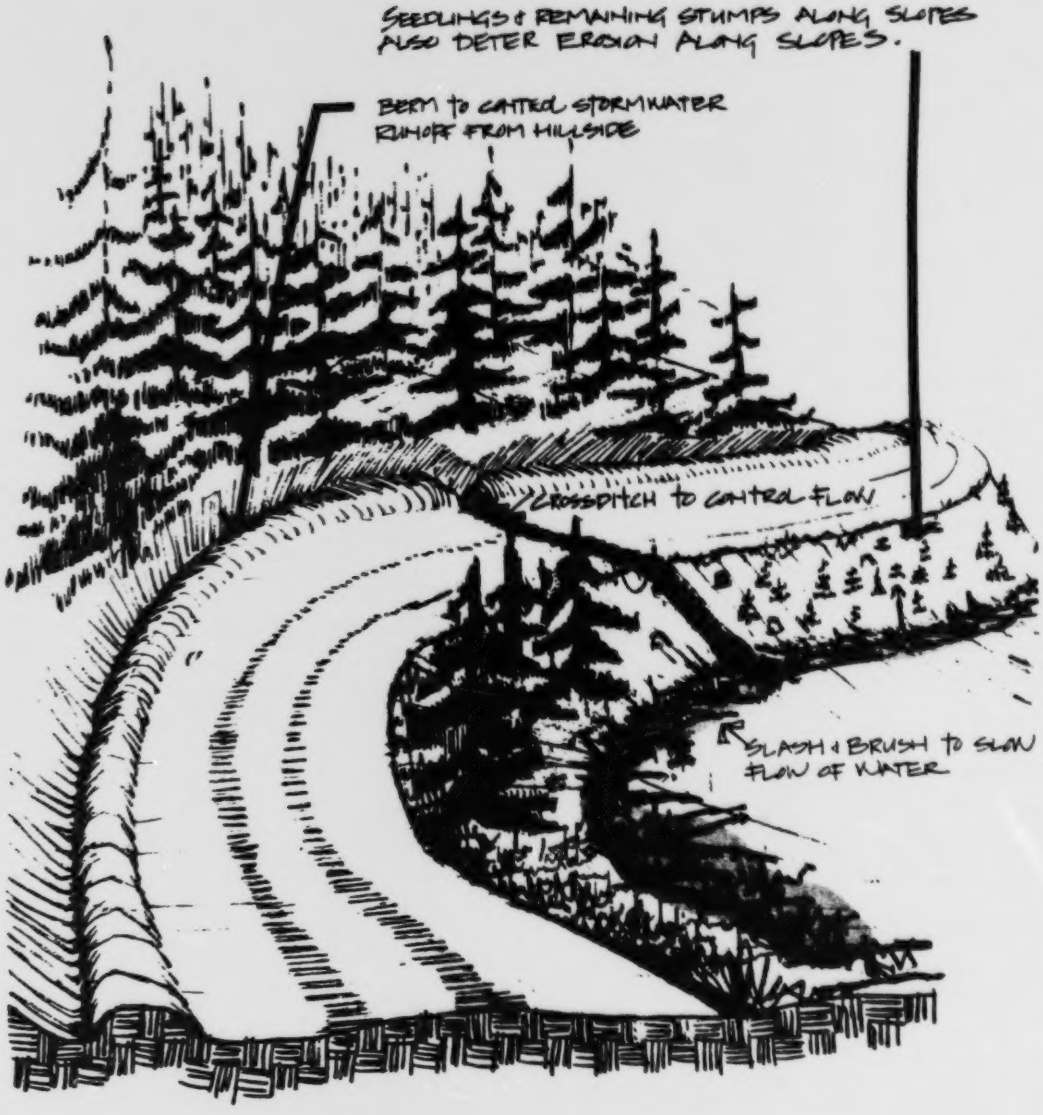

SEEDLINGS & REMAINING STUMPS ALONG SLOPES ALSO DETER EROSION ALONG SLOPES.
BERM TO CONTROL STORMWATER RUNOFF FROM HILLSIDE
CROSSDITCH TO CONTROL FLOW
SLASH & BRUSH TO SLOW FLOW OF WATER

Figure 8.5.3 CROSS DITCHING, BERM AND SLOPE OBSTRUCTIONS USED TO CONTROL STORM WATER RUNOFF AND DETER EROSION

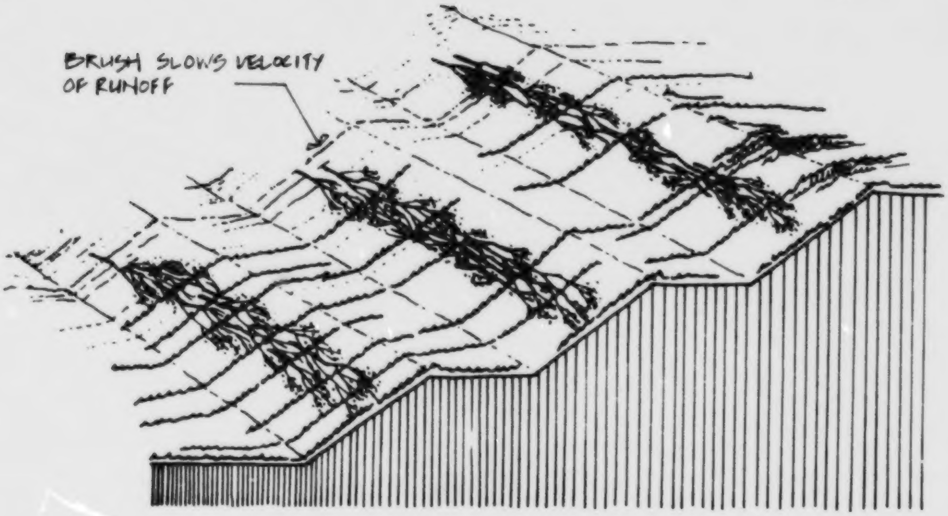

BRUSH SLOWS VELOCITY OF RUNOFF

Figure 8.5.4. STEP SLOPES

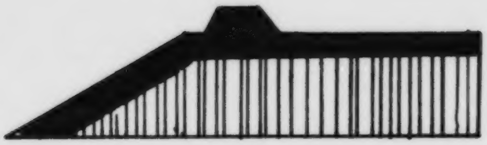
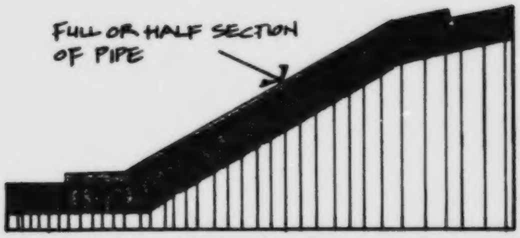


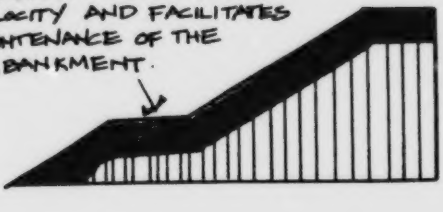
Figure 8.5.5 BERMS AT TOP OF EMBANKMENT



FULL OR HALF SECTION OF PIPE

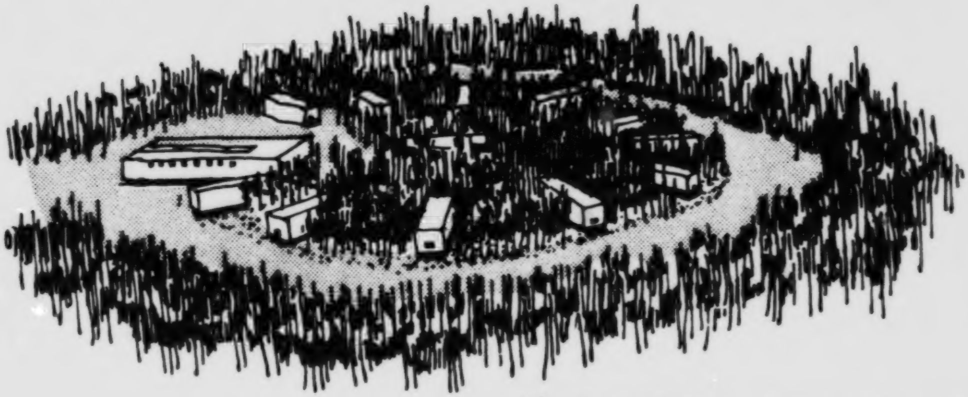
NOTE: BERMS AT TOP OF THE EMBANKMENT DIRECT THE FLOW TO THE SLOPE DRAINS

Figure 8.5.6 SLOPE DRAINS



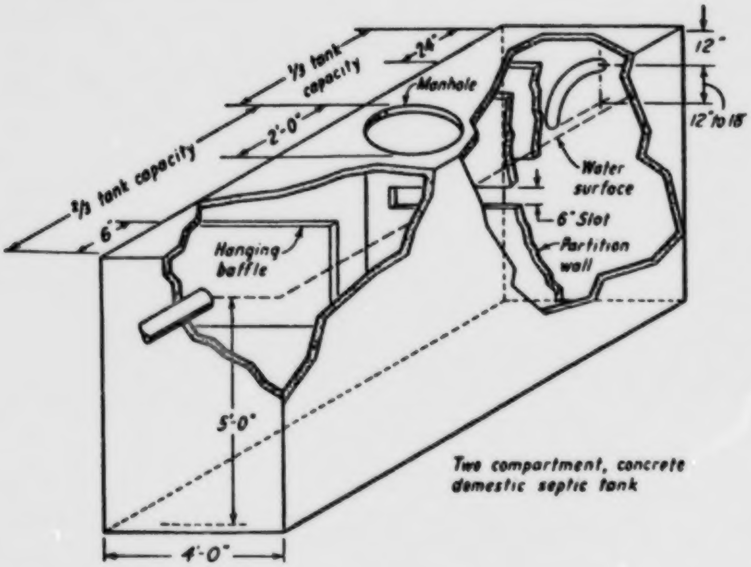
PLATFORM SLOWS RUNOFF VELOCITY AND FACILITATES MAINTENANCE OF THE EMBANKMENT.

Figure 8.5.7 FILL BERMS AND BENCHES



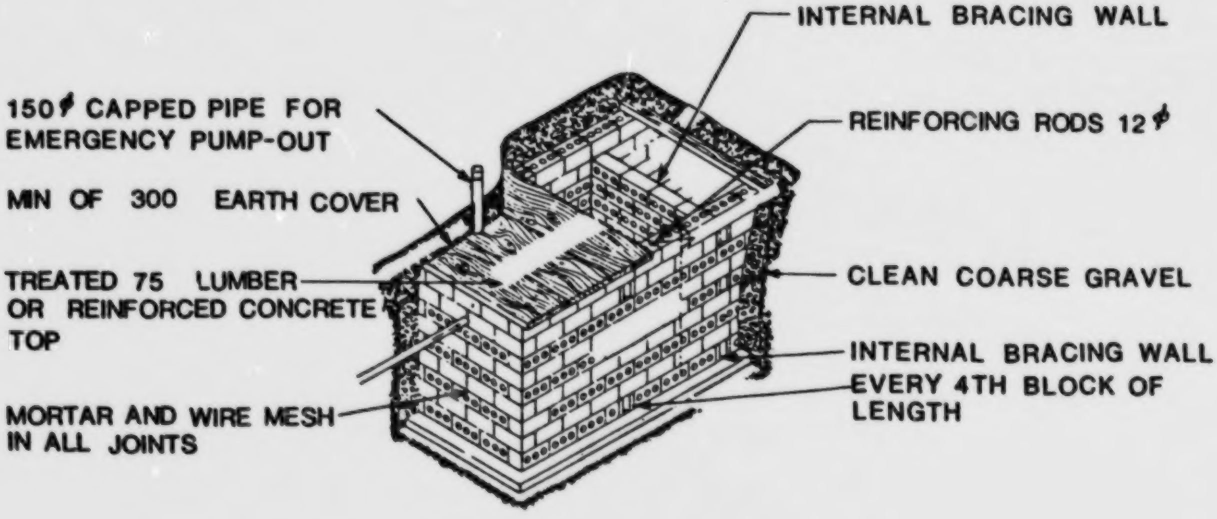
NOTE: TREES USED AS SCREENS

Figure 8.6.1 A WELL LAID OUT CAMP SITE


1/3 tank capacity
24"
Manhole
2'-0"
2/3 tank capacity
6"
Hanging baffle
12"
12" to 18
Water surface
6" Slot
Partition wall
5'-0"
4'-0"

Two compartment, concrete domestic septic tank

SEPTIC TANK


INTERNAL BRACING WALL
150ϕ CAPPED PIPE FOR EMERGENCY PUMP-OUT
REINFORCING RODS 12ϕ
MIN OF 300 EARTH COVER
TREATED 75 LUMBER OR REINFORCED CONCRETE TOP
CLEAN COARSE GRAVEL
INTERNAL BRACING WALL
EVERY 4TH BLOCK OF LENGTH
MORTAR AND WIRE MESH IN ALL JOINTS

LEACHING PIT

Figure 8.6.2 SEPTIC TANK AND LEACHING PIT
(Reference: Health and Welfare Canada)

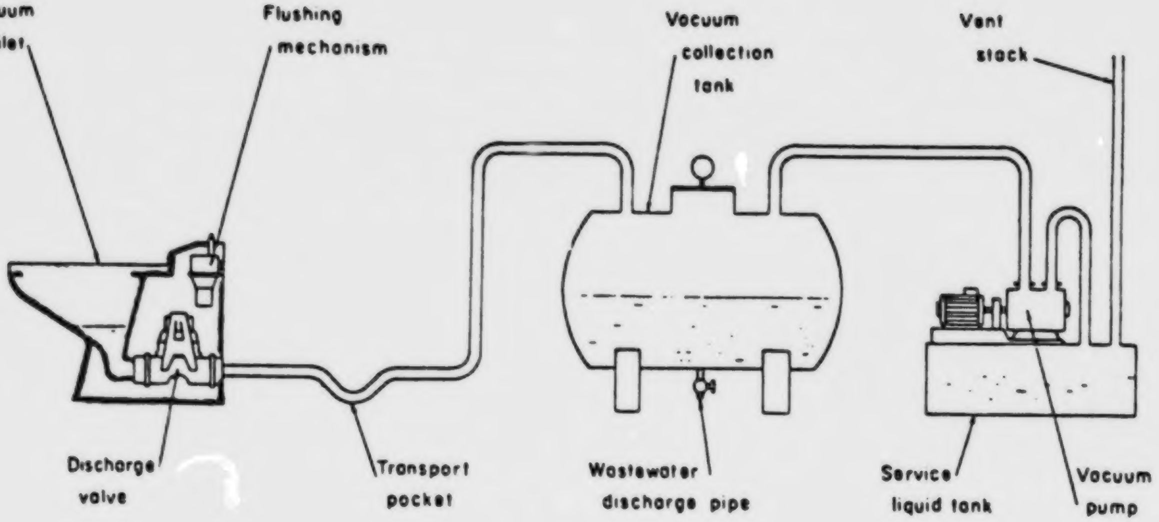

Vacuum toilet
Flushing mechanism
Vacuum collection tank
Vent stack
Discharge valve
Transport pocket
Wastewater discharge pipe
Service liquid tank
Vacuum pump

Figure 8.6.3 BLACK WATER VACUUM SYSTEM - SCHEMATIC
(Reference: Averill, 1974)

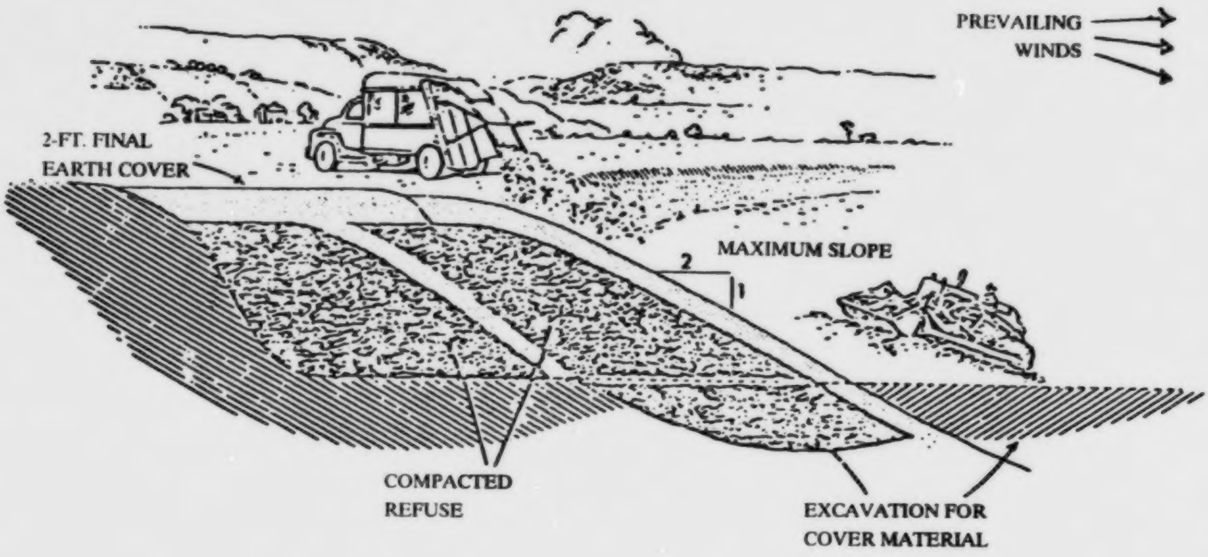

PREVAILING
WINDS
2-FT. FINAL
EARTH COVER
MAXIMUM SLOPE
2
1
COMPACTED
REFUSE
EXCAVATION FOR
COVER MATERIAL

Figure 8.6.4 AREA FILL METHOD
(Reference: Environment Canada, 1976)

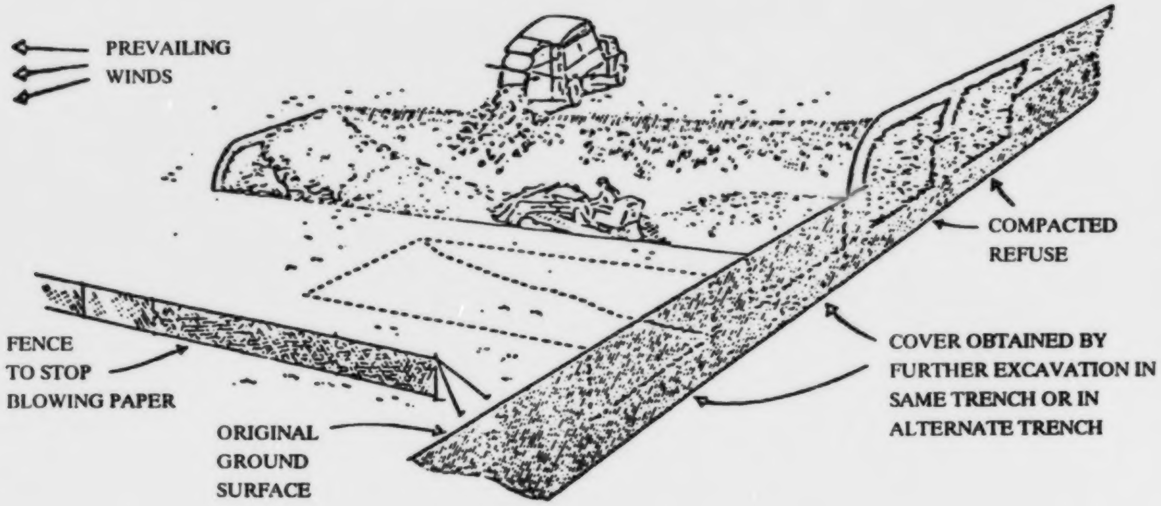

PREVAILING
WINDS
COMPACTED
REFUSE
FENCE
TO STOP
BLOWING PAPER
COVER OBTAINED BY
FURTHER EXCAVATION IN
SAME TRENCH OR IN
ALTERNATE TRENCH
ORIGINAL
GROUND
SURFACE

Figure 8.6 5 TRENCH METHOD
(Reference: Environment Canada, 1976)

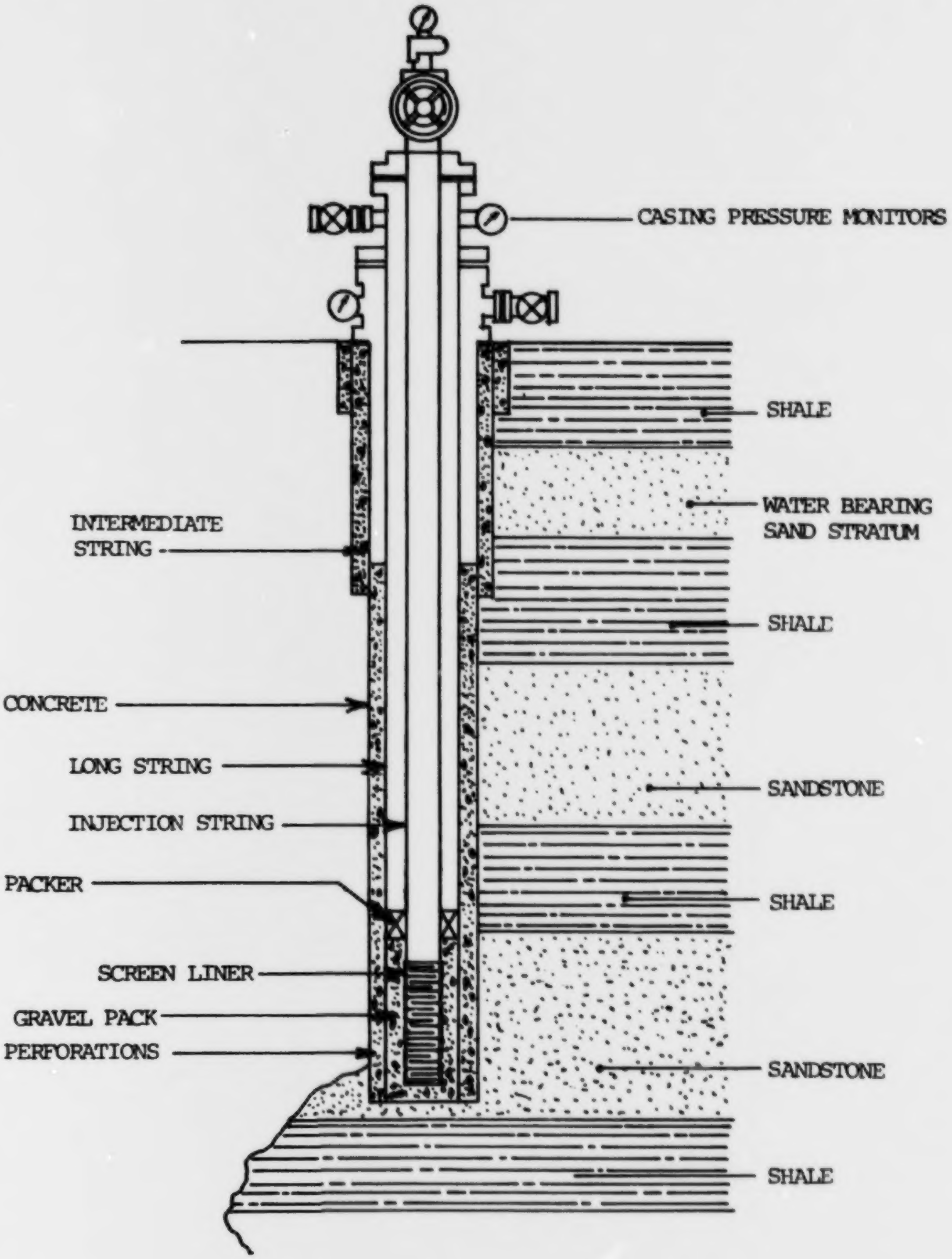

CASING PRESSURE MONITORS
SHALE
WATER BEARING SAND STRATUM
INTERMEDIATE STRING
SHALE
CONCRETE
LONG STRING
SANDSTONE
INJECTION STRING
PACKER
SHALE
SCREEN LINER
GRAVEL PACK
PERFORATIONS
SANDSTONE
SHALE

Figure 8.7.1 A TYPICAL INJECTION WELL

APPENDIX A1

LEGISLATION

Appendix A1

TABLE OF CONTENTS

APPENDIX A1 LEGISLATION

A.1 Provincial and Federal Acts and Applicable Regulations
  A.1.1 The Agricultural Chemicals Act
  A.1.2 The Alberta Historical Resources Act
  A.1.3 The Clean Air Act
  A.1.4 The Clean Water Act
  A.1.5 The Department of Energy Act
  A.1.6 The Department of the Environment Act
  A.1.7 The Department of Forestry, Lands and Wildlife Act
  A.1.8 The Transportation of Dangerous Goods Control Act
  A.1.9 The Energy Resources Conservation Act
  A.1.10 The Fire Protection Act
  A.1.11 The Fisheries Act
  A.1.12 The Forest and Prairie Protection Act
  A.1.13 The Forests Act, 1971
  A.1.14 The Ground Water Development Act
  A.1.15 The Land Surface Conservation and Reclamation Act
  A.1.16 The Litter Act
  A.1.17 The Migratory Bird Act
  A.1.18 The Mines and Minerals Act
  A.1.19 The Oil and Gas Conservation Act
  A.1.20 The Oil Sands Technology and Research Authority Act
  A.1.21 The Oil Sands Conservation Act
  A.1.22 The Pipelines Act, 1975
  A.1.23 The Public Health Act
  A.1.24 The Public Highways Development Act
  A.1.25 The Public Lands Act
  A.1.26 The Water Resources Act

A.1 PROVINCIAL AND FEDERAL ACTS AND REGULATIONS

The Acts and Regulations pertaining to the oil and gas industry in Alberta have been assembled in this section in alphabetical order. Only relevant sections of the Acts have been included.

A.1.1 THE AGRICULTURAL CHEMICALS ACT

This Act generally covers the use, application, transportation and sale of agricultural chemicals including fertilizers and pesticides.

A. Pesticides Sales, Use and Handling Regulations - Alberta Regulation 213/80

1. **Application of Pesticide - Section 5**

(1) No person shall apply or use a pesticide for the control of vegetation along any highway, road, railroad, pipeline, utility line or telephone line, or on grazing leases on public land or on any other public lands in any Green Area of the Province unless he is the holder of a permit from the Minister for that purpose.

(2) In subsection (1), "Green Area of the Province" means the area outlined and coloured green on a map annexed to the Order Classifying Public Lands dated April 16, 1963, and published in the Alberta Gazette on April 30, 1963, as amended from time to time, or any Order made in substitution for that order.

A.1.2 THE ALBERTA HISTORICAL RESOURCES ACT

The following excerpts from the Historical Resources Act are environmentally oriented and applicable to the oil and gas industry.

1. **Right of Entry – Section 33**

(1) The Minister may authorize any person to enter at any reasonable hour and after notice to the owner or occupant

(a) any lands for the purpose of

(i) making surveys for or

(ii) inspecting

historic resource that which the Minister has reason to believe may qualify as a Registered Historic Resource or a Provincial Historic Resource or

(b) any Provincial Historic Resource for the purpose of examining, surveying or recording the site or carrying out excavations and works required for the preservation or development of the site as an historical resource.

(2) Where the Minister is of the opinion that any operation or activity which may be undertaken by any person will, or is likely to, result in the alteration, damage or destruction of historic resources, the Minister may order that person

(a) to carry out an assessment to determine the effect of the proposed operation or activity on historical resources in the area where the operation or activity is carried on,

(b) to prepare and submit to the Minister in accordance with the order, a report containing the assessment of the effect of the proposed operation or activity referred to in clause (a), and

(c) to undertake all salvage, preservative or protective measures or take any other action which the Minister considers necessary.

(3) Notwithstanding anything in any other Act, when the Minister makes an order under subsection (2) he may also require any municipality or other authority in Alberta, the issuance of whose licence, permit, consent or similar authorization is a condition precedent to the commencement or continuation of the operation or activity, to withhold or suspend the licence, permit, consent or other authorization until the Minister is satisfied that any assessment that he has required under subsection (2) (a) or any measure or action that he has required under subsection (2) (c) has been carried out to the Minister's satisfaction.

A.1.3. THE CLEAN AIR ACT

The following excerpts from The Clean Air Act and corresponding Regulations are environmentally oriented and applicable to the oil and gas industry.

1. **Construction Permit – Section 3**

   (1) Subject to the regulations, no person shall commence or continue the construction of

   (a) a plant for the manufacture of petroleum products, natural gas products, chemical and allied products, pulp and paper products, stone, clay or glass products, cement and lime products, fertilizers or animal by-products.

   (b) a plant for primary metal production, metal processing, the processing of wood or wood products, the processing of coal, the processing of natural gas or its derivatives, the production and processing of inorganic chemicals, the manufacture of asphalt or ready-mixed concrete, gravel crushing or meat packing.

   (i) any alteration or addition to anything mentioned in this subsection, unless the Director of Standards and Approvals issues a permit for it.

2. **Licence to Operate – Section 4**

   (1) No person shall commence the operation or use of a plant, structure or thing to which section 3(1) applies unless he is the holder of a licence in respect of the plant, structure or thing.

3. **Changes in Plant, etc. – Section 5**

   (1) No person shall alter, add to or in any other manner change a plant, structure or thing that is the subject of a permit or licence unless a permit to alter, add to or otherwise change a plant, structure or thing is issued by the Director of Standards and Approvals.

4. **Prohibition – Section 6**

   No person shall transfer, sell, lease or otherwise dispose of a permit or licence.

5. **Renewal of Licence – Section 8**

   Before the expiration of the term of a licence, the applicant may apply for a renewal of the licence in accordance with the regulations and the same powers of the Director of Standards and Approvals apply with respect to the application and renewal of a licence as apply to a first application for a licence.

6. **Emission control orders – Section 13**

   (1) If it appears to the Director of Pollution Control

   (a) that there exists in the atmosphere in any part of Alberta an air contaminant

   (i) in concentrations that exceed or in the opinion of the Director of Pollution Control will exceed the maximum permissible concentration prescribed with respect to that contaminant by the regulations,

   (ii) in concentrations that exceed or in the opinion of the Director of Pollution Control will exceed the maximum permissible calculated ground level concentration prescribed with respect to that contaminant by the regulations,

(iii) that exceeds or in the opinion of the Director of Pollution Control will exceed the maximum visible emissions permitted by the regulations to be emitted,

(iv) that has an offensive odour, or

(v) that is or is likely to be detrimental to life or health or to adversely affect property,

or

(b) that an air contaminant has been emitted or is being emitted into the atmosphere from a plant, structure or thing

(i) in concentrations that exceeded, are exceeding or in the opinion of the Director of Pollution Control will exceed the maximum concentration permitted by the regulations to be emitted from any plant, structure or thing, or

(ii) in amounts that exceeded, are exceeding or in the opinion of the Director of Pollution Control will exceed the maximum weight or the maximum rate of emission permitted by the regulations to be emitted from any plant, structure or thing,

the Director of Pollution Control may issue one or more orders directed at persons owning or operating plants, structures or things that the Director of Pollution Control considers to be the source of, or one of the sources of, the air contaminant.

7. Stop Orders – Section 14

(2) In a stop order, the Minister may require that the person to whom it is directed

(a) cease the contravention specified in the order, and

(b) stop any operations or shut down or stop the operation of a plant, equipment, structure or thing, either permanently or for a specified period,

and the stop order shall contain the reasons for making it.

8. Appeal a Stop Order – Section 14

(7) A person to whom a stop order is directed may, within 15 days after service upon that person of a copy of the order, appeal to the Minister in accordance with the regulations for an inquiry into the stop order.

A. Clean Air Regulations – Alberta Regulation 33/73

1. Construction of a Plant – Section 3

(1) No person shall commence the construction of a plant unless he is the holder of a permit therefor issued by the Director of Standards and Approvals.

2. Operation of a Plant – Section 7

(1) No person shall commence the operation or use of a plant unless he is the holder of a licence therefor issued by the Director of Standards and Approvals.

3. Amendment to a Permit – Section 13

(1) No person shall alter, add to or in any other manner change a plant that is the subject of a permit or licence unless a permit to add to, alter or otherwise change the plant has been issued by the Director of Standards and Approvals.

4. Amendment to a Licence – Section 18

(1) Where a licence is in existence and a new permit has been issued or an amendment to a permit made, the holder of the licence shall apply to the Director for an amendment to his licence at least 60 days before the proposed commencement of operations associated with the new or amended permits.

B. Stop Order Appeal Regulations – Alberta Regulation 9/74

Form A is to be filed within 15 days of a Stop Order.

(Note: Form A is included on page 1-29 of this Appendix.)

C. Natural Gas Processing Plant Delegation Regulations – Alberta Regulation 88/74

These regulations designate the Energy Resources Conservation Board as a Government agency with the same power and authority as the Director of Pollution Control and stipulates the fine for an offence under the Clean Air Act not to exceed $5,000.

D. Clean Air (General) Regulations – Alberta Regulation 216/75
amended by 24/86

1. **Burning Prohibited Without Written Approval – Section 5**

   The release of toxic air contaminants to the atmosphere is prohibited unless the written approval of the Director of Standards and Approvals has first been obtained.

2. **Burning Prohibited Without Written Approval – Section 6**

   No person shall make an open fire by burning, or use an open fire for burning any prohibited debris anywhere in Alberta unless the written approval of the Director of Standards and Approvals has first been obtained.

E. Clean Air (Maximum Level) Regulations – Alberta Regulation 218/75
amended by 40/84

These regulations set forth maximum permissible concentrations of air contaminants and visible and particulate emissions.

A.1.4 THE CLEAN WATER ACT

The following excerpts from the Clean Water Act and corresponding Regulations are environmentally oriented and applicable to the oil and gas industry.

1. **Permit for Construction (Water Facility) – Section 3**

   (1) Subject to the regulations, no person shall commence the construction of

   (e) any plant for the manufacture of petroleum products, natural gas products, chemical and allied products,pulp and paper products, steel, clay or glass products, cement and lime products, fertilizers or animal by-products.

   (f) a plant for primary metal production, metal processing, the processing of wood or wood products, the processing of coal, the processing of natural gas or its derivaties, the production and processing of inorganic chemicals, the manufacture of asphalt or ready-mixed concrete or gravel crushing.

   (g) any alteration or addition to anything mentioned in this subsection

   unless the Director of Standards and Approvals issues a permit for it.

2. **Licence for Operation – Section 4**

   (1) No person shall commence the operation or use of a water facility unless he is the holder of a licence in respect of the water facility.

   (2) On or shortly before completion of the construction of a water facility, the person who intends to operate or use the water facility shall apply to the Director of Standards and Approvals in accordance with the regulations for the issue of a licence.

3. **Alterations – Section 5**

   (1) No person shall alter, add to or in any other manner change a water facility that is the subject of a permit or licence unless a permit to alter, add to or otherwise change the water facility is issued by the Director of Standards or Approvals.

4. **Stop Orders – Section 15**

   (1) If the Minister is satisfied that a person

   (a) has contravened or is contravening this Act or a regulation or order under the Act,

   (b) has failed to comply with an order or direction of the Director of Pollution Control under this Act or under the regulations,

   (c) owns or operates any plant, structure or thing that is a source of water pollution that the Minister considers to be an immediate danger to human life or property or both, or

   (d) has contravened a term or condition of a licence,

   the Minister may issue an order to that person in accordance with subsection (2).

5. **Appeal a Stop Order – Section 15**

   (7) A person to whom a stop order is directed may, within 15 days after service on him of a copy of the order, appeal to the Minister for an inquiry into the stop order.

6. **Prohibition re Deposit of Water Contaminants – Section 17**

   (1) Subject to subsection (2), no person shall deposit or permit the deposit of a water contaminant

   (a) in a watercourse

   (b) in surface water

   (c) in underground fresh water, or

   (d) in any place under any conditions where that water contaminant or any other water contaminant that results from the deposit of the water contaminant may enter any watercourse, surface water or underground fresh water,

   if it degrades, alters or forms part of or is likely to degrade, alter or form part of the process of degradation or alteration of the chemical or biological quality of water, so that the water in the watercourse, surface water or underground fresh water is or is likely to be rendered harmful to human health or life, fish, wildlife, livestock or plants.

   (2) Subsection (1) does not apply to the deposit of a water contaminant of a type, in a quantity and under terms and conditions stated

   (a) in an approval or certificate issued by the Provincial Board of Health pursuant to the Public Health Act or regulations under it,

   (b) in an approval issued by the Director of Pollution Control pursuant to this Act or regulations under it,

   (c) in a licence issued by the Director of Standards and Approvals pursuant to this Act or regulations under it,

   (d) in an approval permit or licence issued by the Energy Resources Conservation Board, or

   (e) in a permit issued pursuant to the Agricultural Chemicals Act.

A. Clean Water (General) Regulation – Alberta Regulation 35/73

amended by 66/86

1. **General Prohibitions – Section 11**

   (1) No person shall, without the written permission of the Director of Standards and Approvals or the Director of Pollution Control, discharge, deposit, drain, cause or allow to be deposited upon the banks of or into any reservoir, surface water or watercourse any substance capable of changing the quality of the water or causing water contamination.

B. Clean Water (Industrial Plants) Regulations – Alberta Regulation 36/73

1. **Construction of a Plant – Section 4**

   (1) No person shall commence the construction of an industrial plant unless he is the holder of a permit therefor issued by the Director of Standards and Approvals.

2. **Operation of a Plant – Section 8**

(1) No person shall commence the operation or use of an industrial plant unless he is the holder of a licence therefor issued by the Director of Standards and Approvals.

3. **Application for an Amendment to a Permit – Section 14**

(1) No person shall alter, add to or in any other manner change an industrial plant that is the subject of a permit or licence unless a permit to add to, alter or otherwise change the industrial plant has been issued by the Director of Standards and Approvals.

A.1.5 THE DEPARTMENT OF ENERGY ACT

1. **Establishment of Department - Section 2**

There shall be a department of the Government called the Department of Energy over which shall preside the member of the Executive Council appointed by the Lieutenant Governor under the Great Seal of the Province as Minister of Energy.

2. **Definition - Section 8**

In sections 10 to 13, "Advisory Committee" means the Advisory Committee on Heavy Oil and Oil Sands Development established under section 9.

3. **Advisory Committee - Section 9**

There is hereby established a committee called the Advisory Committee on Heavy Oil and Oil Sands Development.

4. **Members of Advisory Committee - Section 10**

(1) The Advisory Committee shall consist of the following members:

- (a) a member of the Legislative Assembly, who shall also be the chairman of the Advisory Committee;
- (b) 3 persons who are representative of residents of those areas of Alberta containing heavy oil and oil sands resources;
- (c) 1 person who is representative of organizations engaged in the business of developing or servicing heavy oil and oil sands resources;
- (d) 1 person who is a representative of the Energy Resources Conservation Board;
- (e) 1 person who is a representative of the Department.

5. **Functions of Advisory Committee - Section 13**

(1) The functions of the Advisory Committee are the following:

- (a) to provide a continuing liaison between the Minister and the representatives of communities that are or may be affected by the possible development of heavy oil or oil sands resources in the vicinity of those communities;
- (b) to advise the Minister on the possible need for and scheduling of programs to provide public services and facilities in areas of Alberta affected by the development of heavy oil or oil sands resources in keeping with the pace and scale of that development;
- (c) generally, to establish and co-ordinate a continuing communication among
    - (i) the organizations engaging in the business of the development of heavy oil and oil sands resources,
    - (ii) the residents of communities of Alberta directly affected by that development, and
    - (iii) the various departments and agencies concerned with the regulation of that development

in relation to those aspects of the development that affect the residents of Alberta.

(2) The Advisory Committee shall, on being requested to do so by an order of the Minister, hold public hearings for the purpose of receiving briefs and submissions on any matter pertaining to the development of heavy oil or oil sands resources specified in the order, and shall report on the matter to the Minister.

6. **Expiry - Section 15**

   Sections 8 to 13 expire on December 31, 1987 unless they are continued by an order of the Lieutenant Governor in Council. (NOTE: Expiry extended to December 31, 1990 by O.C. 245/87.)

7. **Repeal - Section 16**

   The Department of Energy and Natural Resources Act is repealed.

A.1.6 THE DEPARTMENT OF THE ENVIRONMENT ACT

In general, this Act sets forth the operation, function and administration of the Department of the Environment and creates the Natural Resources Coordinating Council and the Conservation and Utilization Committee.

1. **Stop Orders – Section 17**

   (1) If the Minister is satisfied that a person

   (a) has contravened or is contravening this Act or a regulation or order under this Act, or

   (b) has contravened or is contravening any other Act or any regulation or order thereunder and the contravention, in the opinion of the Minister, is causing or is likely to cause the destruction, damage or pollution of a natural resource,

   the Minister may issue an order (in this section called a "stop order") to that person in accordance with subsection (2).

2. **Appeal a Stop Order – Section 17**

   (7) A person to whom a stop order is directed may, within 15 days after service on him of a copy of the stop order, appeal to the Minister in accordance with the regulations for an inquiry into the stop order.

A. Stop Order Appeal Regulations – Alberta Regulation 9/74

See A.1.15 (Land Surface Conservation and Reclamation Act).

A.1.7 THE DEPARTMENT OF FORESTRY LANDS AND WILDLIFE ACT

1. **Establishment of Department -Section 2**

   There shall be a department of the Government called the Department of Forestry, Lands and Wildlife over which shall preside the member of the Executive Council appointed by the Lieutenant Governor under the Great Seal of the Province as Minister of Forestry, Lands and Wildlife.

3. **Amends RSA 1980 cD-19 - Section 10**

   The Department of the Environment Act is amended

   (a) in section 11(1) by adding the following after clause (g):
   (g.1) the Deputy Minister of Forestry, Lands and Wildlife,

   (b) in section 12(2) by adding the following after clause (h):
   (h.1) the Department of Forestry, Lands and Wildlife;

3. **Amends RSA 1980 cF-9 - Section 11**

Section 1(1)(u)(ix) of the Financial Administration Act is repealed and the following is substituted:

(ix) the revolving fund established under section 8 of the Department of Forestry, Lands and Wildlife Act, or

4. **Amends RSA 1980 cH-13 - Section 12**

Section 18(3) of the Hydro and Electric Energy Act is amended by striking out, "the Minister of Energy and Natural Resources and the Associate Minister of Public Lands and Wildlife or any of them," and substituting "or the Minister of Forestry, Lands and Wildlife".

5. **Amends RSA 1980 cL-3 - Section 13**

The Land Surface Conservation and Reclamation Act is amended in section 15

(a) by repealing subsection (2)(b) and substituting the following:

(b) 1 deputy chairman of the Council who is an employee of the Department of Energy designated by the Minister of Energy, and 1 deputy chairman of the Council who is an employee of the Department of Forestry, Lands and Wildlife designated by the Minister of Forestry, Lands and Wildlife;

(b) by repealing subsection (10) and substituting the following:

(10) The Minister of Energy shall, for the deputy chairman he has designated under subsection (2)(b), designate an employee of the Department of Energy as an acting deputy chairman to act in the event of the absence or inability to act of the deputy chairman or of a vacancy in the office of the deputy chairman.

6. **Amends RSA 1980 cO-5 - Section 14**

The Oil and Gas Conservation Act is amended in section 14.1

(a) in subsection (3) by striking out "Associate Minister of Public Lands and Wildlife" wherever it occurs and substituting "Minister of Forestry, Lands and Wildlife";

(b) by repealing subsection (4) and substituting the following:

(4) The Minister of Forestry, Lands and Wildlife may authorize an officer of the Department of Forestry, Lands and Wildlife to exercise the powers conferred on him under this section.

7. **Amends RSA 1980 cS-20 - Section 15**

The Special Areas Act is amended by repealing section 6(2) and substituting the following:

(2) If any provision of the Public Lands Act or of any regulation under that Act is made applicable to special areas, a reference in it to

(a) the Minister of Lands and Forests, the Deputy Minister of Lands and Forests, the Department of Lands and Forests or the Director of Lands,

(b) the Associate Minister of Public Lands and Wildlife, the Deputy Minister of Renewable Resources, the Department of Energy and Natural Resources or the Assistant Deputy Minister of Public Lands, or

(c) the Minister of Forestry, Lands and Wildlife, the Deputy Minister of Forestry, Lands and Wildlife, the Department of Forestry, Lands and Wildlife or the Assistant Deputy Minister of Public Lands

is deemed to be a reference to the Minister or Deputy Minister of Municipal Affairs, the Department of Municipal Affairs or the Special Areas Board, as the case may be.

8. **Amends RSA 1980 cW-8 - Section 16**

The Wilderness Areas, Ecological Reserves and Natural Areas Act is amended in section 2(4)

(a) in clause (b) by striking out "3 employees" and substituting "1 employee";

(b) by adding the following after clause (b):

(b.1) 2 employees of the Department of Forestry, Lands and Wildlife,

9. **Consequential - Section 17**

The following provisions are amended by striking out "Associate Minister of Public Lands and Wildlife" wherever it occurs and substituting "Minister of Forestry, Lands and Wildlife":

Act	Section number
Department of the Environment Act	9(2)
Fish Marketing Act	1(d)
Homestead Lease Loan Act	1(f)
Hydro and Electric Energy Act	13(1)(b),(2),(3) and (4)
Land Surface Conservation and Reclamation Act	36(1) and (2)
The Metis Betterment Act	6(2),22(1) and (2)
Municipal Government Act	156(2)
Oil Sands Conservation Act	12(1)(b),(2),(3),(4),14(3) and 19(2)(b),(3)
Public Lands Act	1(m)
Special Areas Act	5(c)
Wilderness Areas, Ecological Reserves and Natural Areas Act	1(d)(ii) and 12(2)(b)
Wildlife Act cW-9	1(j)
Wildlife Act cW-9.1	56(1)(a)

10. **Consequential - Section 18**

The following provisions are amended by striking out "Energy and Natural Resources" wherever it occurs and substituting "Forestry, Lands and Wildlife":

Act	Section Number
Agricultural Relief Advances Act	20(2)
Crowsnest Pass Municipal Unification Act	19(2)
Department of Agriculture Act	10(2)
Forest Development Research Trust Fund Act	1(c) and 3(2)
Forest and Prairie Protection Act	1(c)
Forest Reserves Act	1(b)
Forests Act	1(i)
Highway Traffic Act	14(1)(e)
Homestead Lease Loan Act	8(2) and 10(2)
Hydro and Electric Energy Act	7(4)(b) and (5), 32(2)
Municipal Government Act	271
Pipeline Act	8(1),(2),(3),(4) and 36(3)
Public Lands Act	1(d)
Surveys Act	85(2)
Threshers' Lien Act	8(2)
Water Resources Act	1(r)(ii) and 67(a)
Water Resources Commission Act	3(1)(g)
Wildlife Act cW-9	1(a.01),6.1 and 127

A.1.8 THE TRANSPORTATION OF DANGEROUS GOODS CONTROL ACT

This Act allows the Province to control those aspects of the movement of dangerous goods which are considered to be under Provincial jurisdiction. Alberta Public Safety Services, Dangerous Goods Control Division is charged with the administration of the Act and related regulations.

1. **Permits For Exemption – Section 4**

(2) The Minister may issue a permit exempting from the application of this Act the handling, offering for transport or transportation of dangerous goods in a vehicle.

2. **Permits for Equivalent Standards – Section 5**

(1) The Minister may, in accordance with the regulations, issue a permit, subject to any terms and conditions specified in the permit, authorizing the handling, offering for transport or transporting of dangerous goods in a manner that does not comply with this Act and the regulations where he is satisfied that the manner of handling, offering for transport or transporting provides a level of safety at least equivalent to that provided by compliance with this Act and the regulations.

3. **Powers Of Inspectors – Section 7**

(1) For the purpose of ensuring compliance with this Act and the regulations, an inspector may, at any reasonable time without a warrant, enter and inspect a place or a vehicle and its load or a building, other than a private dwelling, where he believes that dangerous goods are being handled, offered for transport or transported and request the opening and inspection of or open and inspect any container, packaging or vehicle in or by which he believes that the dangerous goods are being handled, offered for transport or transported.

4. **Stop Orders – Section 12**

(1) Where the Minister or a person designated by the Minister considers it to be necessary for the protection of public safety, property or the environment, he may, subject to any regulations made pursuant to section 16(1)(r), direct any person engaged in handling, offering for transport or transporting dangerous goods to cease any activity with respect to the handling, offering for transport or transporting or to carry it on in the manner directed.

A. Transportation of Dangerous Goods Control Regulation – Alberta Regulation 383/85

These regulations allow the adoption of Parts I to IX of the Federal Transportation of Dangerous Goods Regulations.

B. Administration Regulation – Alberta Regulation 37/86

1. **Stop Orders Review – Part 1, Section 3**

(1) A person may, within 30 days after being notified of a stop order, apply to the Executive Director for a review of the stop order in accordance with section 4.

2. **Permit Applications – Part 2, Sections 12 and 18**

(12) An application for a permit for equivalent level of safety shall be made to the Minister or a designated person by completing Form 1 of the Schedule.

(18) An application for a permit for exception shall be made to the Minister or a designated person by completing Form 3 of the Schedule.
(Note: forms 1 and 3 are not included in this Appendix.)

A.1.9 THE ENERGY RESOURCES CONSERVATION ACT

1. **Purposes of Act – Section 2**

The purposes of this Act are

(a) to provide for the appraisal of the reserves and productive capacity of energy resources and energy in Alberta;

(b) to provide for the appraisal of the requirements for energy resources and energy in Alberta and of markets outside Alberta for Alberta energy resources or energy;

(c) to effect the conservation of, and to prevent the waste of, the energy resources of Alberta;

(d) to control pollution and ensure environment conservation in the exploration for, processing, development and transportation of the energy resources and energy;

(e) to secure the observance of safe and efficient practices in the exploration for, processing, development and transportation of the energy resources of Alberta;

(f) to provide for the recording and timely and useful dissemination of information regarding the energy resources of Alberta;

(g) to provide agencies from which the Lieutenant Governor in Council may receive information, advice and recommendations regarding energy resources and energy.

2. **Hearings – Section 29**

(1) Unless it is otherwise expressly provided by this Act to the contrary, any order or direction that the Board is authorized to make may be made on its own motion or initiative, and without the giving of notice, and without holding a hearing.

(2) Notwithstanding subsection (1), if it appears to the Board that its decision on an application may directly and adversely affect the rights of a person, the Board shall give the person

(a) notice of the application,

(b) a reasonable opportunity of learning the facts bearing on the application and presented to the Board by the applicant and other parties to the application.

(c) a reasonable opportunity to furnish evidence relevant to the application or in contradiction or explanation of the facts or allegations in the application,

(d) an adequate opportunity of making representations by way of argument to the Board or its examiners.

(3) When by subsection (2) a person is entitled to make representations to the Board or its examiners, the Board is not or examiners are not by subsection (2) required to afford an opportunity to the person

(a) to make oral representations, or

(b) to be represented by council.

If the Board or examiners afford the person an opportunity to make representations adequately in writing, unless the statutory provision authorizing the Board's decision requires that a hearing be held.

3. **Powers of the Board on Hearing – Section 32**

If the Board is charged with the conduct of a hearing, inquiry or other investigation by or pursuant to any other Act, it has for the purpose of conducting the inquiry, hearing or other investigation all of the powers granted to it by this Act for the purpose of conducting an inquiry, hearing or other investigation, and each witness at the inquiry, hearing or other investigation pursuant to any other Act shall have the protection given a witness by this Act.

4. **Appeal – Section 44**

(1) Subject to subsection (2), on a question of jurisdiction or on a question of law, an appeal lies from the Board to the Court of Appeal.

A.1.10 THE FIRE PROTECTION ACT

1. **Industrial Operations – General Precautions– Section 12**

(1) An operator of a sawmill, planing mill, logging camp or any kind of industrial operation in or within 1 kilometre of the forest protection area shall, unless otherwise authorized by a forest officer,

(a) clear of all trees, shrubs and other inflammable material the area in which the mill, factory or operation is being located,

(b) maintain a cleared distance of not less than 30 metres from the mill, factory, structure or operation to the closest standing timber, and

(c) maintain a clear bare mineral soil surface extending at least 8 metres around each burner, pit or other source of fire.

2. **Oil and Gas Well Precautions – Section 14**

(1) No person may burn in a flare pit any materials produced from an oil or gas well unless

(a) the area around the flare pit has been cleared of all combustible debris within 30 metres thereof or a fireguard has been made in any other manner specified by a forest officer,

(b) a clear bare mineral soil surface extending at least 8 metres around the flare pit is maintained;

(c) the flare pit is so constructed that burning debris cannot escape from the flare pit at any time,

(d) the discharge tip of the flare line is directed into the flare pit at an angle of not less than thirty degrees below horizontal.

3. **Oil and Gas Well Precautions – Section 15**

(1) No person may burn sour gas at the end of a vertical pipe in a forest unless the distance from the base of the vertical pipe to the closest debris is two and one-half times the length of the vertical pipe, or such other distance as may be prescribed by a forest officer.

4. **Fire Fighting Equipment – Section 26**

(1) A person carrying on or being in charge of a timber, forest, mining, drilling or other industrial or commercial operation in or within 1 kilometre of any public land shall keep at the site available for immediate use an adequate water supply for fire fighting purposes plus at least the equipment listed in Table "A" in good working condition, according to the number of men employed at the site.

A.1.11 THE FISHERIES ACT

The Fisheries Act is a Government of Canada Act administered by the Fish and Wildlife Division of Alberta Forestry, Lands and Wildlife.

1. **Destruction of Fish – Section 30**

No person shall destroy fish by any means other than fishing except as authorized by the Minister or under regulations made by the Governor in Council under this Act.

2. **Harmful Alteration – Section 31**

(1) No person shall carry on any work or undertaking that results in the harmful alteration, disruption or destruction of fish habitat.

(2) No person contravenes subsection (1) by causing the alteration, disruption or destruction of fish habitat by any means or under any conditions authorized by the Minister or under regulations made by the Governor in Council under this Act.

3. **Injury to Fishing Grounds and Pollution of Waters – Section 33**

(1) No one shall throw overboard ballast, coal ashes, stones, or other prejudicial or deleterious substances in any river, harbour or roadstead, or in any water where fishing is carried on, or leave or deposit or cause to be thrown, left or deposited, upon the shore, beach or bank of any water or upon the beach between high and low water mark, remains or offal of fish, or of marine animals, or leave decayed or decaying fish in any net or other fishing apparatus; such remains or offal may be buried ashore, above high water mark.

(2) Subject to subsection (4), no person shall deposit or permit the deposit of a deleterious substance of any type in water frequented by fish or in any place under any conditions where such deleterious substance or any other deleterious substance that results from the deposit of such deleterious substance may enter any such water.

(3) No person engaging in logging, lumbering, land clearing or other operations, shall put or knowingly permit to be put, any slash, stumps or other debris into any water frequented by fish or that flows into such water, or on the ice over either such water, or at a place from which it is likely to be carried into either such water.

(4) No person contravenes subsection (2) by depositing or permitting the deposit in any water or place

(a) of waste or pollutant of a type, in a quantity and under conditions authorized by regulations applicable to that water or place made by the Governor in Council under any Act other than this Act; or

(b) of a deleterious substance of a class, in a quantity or concentration and under conditions authorized by or pursuant to regulations applicable to that water or place or to any work or undertaking or class thereof, made by the Governor in Council under subsection (13).

A.1.12 THE FOREST AND PRAIRIE PROTECTION ACT

The following excerpts from The Forest Prairie and Protection Act are environmentally oriented and applicable to the oil and gas industry.

1. Oil and Gas Industry Pollution Clean-up Operations – Section 29

The Minister, on the request of any Minister or agency of the Government charged with responsibility in relation to pollution related to the oil and gas industry in Alberta, may authorize the use of employees and equipment of the Department for clean-up operations necessitated by the pollution and in that event forest officers and fire guardians may

(a) require any able bodied adult person not exempted by regulations, to assist in clean-up operations and

(b) commandeer and authorize payment for the possession or use of any equipment for clean-up operations.

A.1.13 THE FORESTS ACT, 1971

This Act generally provides for the administration and management of the forests within the Province and empowers the Minister to make regulations pertaining to use and operations.

A. Timber Management Regulation

1. Clearing Land for Industrial Use – Sections 146 to 151

146. A person clearing land for industrial use shall take all necessary precautions to minimize soil erosion and to avoid pollution of waters and waterways and shall keep records of all timber produced, sold or transported.

147. The Minister, in his discretion, may relieve an industrial operator from salvaging timber.

148. Where in that part of the Green Area of Alberta lying south of an imaginary line described in Appendix "A" of the Forest and Prairie Protection Regulations Part II there are 25 or more merchantable and green coniferous trees exceeding 15 meters in height on a hectare of land to be cleared, those trees shall be cut, lopped of roots, branches and 6 metre tops and decked separately from all other trees and debris on clear land.

149. In the event that a large number of trees are to be decked and no natural clearing is available in the area, the operator may clear 0.2 hectares of deciduous or unmerchantable coniferous timber within each section of land for that purpose.

150. An industrial operator shall, within 60 days of clearing land, remove therefrom the decked timber and put it to some beneficial use or dispose of it by sale or gift.

151. Decked timber left for a period exceeding 60 days on the site of an industrial clearing is forfeited to the Minister.

A.1.14 THE GROUND WATER DEVELOPMENT ACT

This Act pertains to the licensing of water well drillers, the control of flowing water wells and the submission of drilling reports.

A.1.15 THE LAND SURFACE CONSERVATION AND RECLAMATION ACT

The following excerpts from The Land Surface Conservation and Reclamation Act and corresponding regulations are environmentally oriented and applicable to the oil and gas industry.

1. **Stop Orders – Section 9**

(1) If the Minister is satisfied that any person

(a) has contravened or is contravening a provision of this Act or a regulation or order under this Act,

(b) has failed to comply with an order or direction of the Council under this Act or under the regulations, or

(c) is carrying on an operation under the authority of an approval under Part 2 but the operation is resulting in a degree of surface disturbance or other damage or consequences that could not have been reasonably foreseen at the time the approval was issued,

the Minister may issue an order (in this section called a "stop order") to that person in accordance with subsection (2).

2. **Appeal a Stop Order – Section 9**

(7) A person to whom a stop order is directed may, within 15 days after service upon him of a copy of the order, appeal to the Minister in accordance with the regulations for an inquiry into the stop order. (See Form A under Stop Order Appeal Regulations included on page A1–29 of this Appendix)

3. **Designation of Regulated Surface Operations – Section 23**

(1) The Lieutenant Governor in Council may by regulations designate any kind of operation or activity as a regulated surface operation if the operation or activity is also of a kind falling within the following descriptions:

(a) the drilling, operation or abandonment of a well;

(b) the constrution, operation or abandonment of a pipeline, battery, transmission line or telecommunications line;

(c) the opening up, operation or abandonment of a mine or quarry;

(d) the opening up, operation or abandonment of a pit or of a waste disposal site or land fill site;

(e) exploration operations that result or will result in surface disturbance;

(f) the construction, operation or abandonment of a mineral processing plant, road, railway or aircraft landing strip;

(f1) the construction, operation or abandonment of a plant

(i) for the manufacture of petroleum products or natural gas products,
(ii) for the manufacture of chemical and allied products,
(iii) for the manufacture of pulp and paper,
(iv) for the manufacture of steel, clay or glass products,
(v) for the manufacture of cement and lime products,
(vi) for the manufacture of fertilizer or processing of animal by-products,
(vii) for primary metal production or metal processing purposes,
(viii) for the processing of wood or wood products,
(ix) for the processing of coal or oil sands,
(x) for the processing of natural gas or its derivatives,
(xi) for the production or processing of chemicals,
(xii) for the manufacture of asphalt or ready-mixed concrete,
(xiii) for gravel crushing,
(xiv) for meat packing, food processing or beverage processing purposes,
(xv) for generating thermal electric power or steam, or
(xvi) for any other industrial, manufacturing or processing purposes;

(g) the construction, operation or abandonment of any structure (including a micro-wave tower) forming part of a broadcasting undertaking as defined in the Broadcasting Act (Canada);

(h) the construction, operation or abandonment of a site for subsurface disposal of solid or liquid waste;

(i) the conduct of examinations and surveys on land made in connection with water or the conduct of exploration in respect of surface and subsurface water;

(j) the construction of any works for the impoundment, conveying or diversion of water;

(k) the preparation of land to be used for the purpose of industrial sites or for recreational development;

(l) the excavation and removal of top soil or peat for the purposes of sale;

(m) the excavation and removal of archaeological findings;

(n) any alteration of or extension of any operation or activity referred to in clauses (a) to (m).

(2) If an operation or activity is designated as a regulated surface operation by a regulation under subsection (1), the regulation

(a) shall also specify either that the designation applies to all of Alberta or, if not, the part of Alberta to which it applies, and

(b) may also restrict the designation by limiting or specifying the circumstances in which the operation or activity is to be a regulated surface operation.

(3) If an operation or activity is designated as a regulated surface operation by a regulation under subsection (1) and the regulation applies to operations or activities that are being carried on at the date of the commencement of the regulation or were being carried on at any time during the year in which the regulation came into force, the regulation shall also fix a date not later than 18 months from the commencement of the regulation by which persons conducting the regulated surface operation are required to obtain an approval in respect of the operation.

4. Surface Disturbance Control Order – Section 28

(1) If a person has commenced a regulated surface operation in contravention of Section 24 or is carrying on a regulated surface operation in contravention of any regulations made under Section 23 or Section 25, the Minister may cause to be served on that person an order directing him to cease the operation immediately until he has complied with Section 24 or the regulations, as the case requires.

(2) If a person is carrying on a regulated surface operation either not in accordance with the approved plans and specifications or in contravention of the conditions of the approval, the Minister may cause to be served on that person an order directing him to cease the operation immediately until he satisfies the Minister that the operation will be carried on in accordance with the approved plans and specifications and the conditions of the approval.

(3) An order under subsection (1) or (2) may be referred to as a "surface disturbance control order".

5. Application of Part 3 (Reclamation Orders and Certificates) – Section 35

(1) Subject to regulations made under Section 38, (1)(a) and except as provided in Section 44, this Part applies to land that is being or has been used for or in connection with, or is being held or has been held incidental to or in connection with,

(a) the drilling, operation or abandonment of a well,

(b) the construction, operation or abandonment of a pipeline, battery or transmission line,

(c) the opening up, operation or abandonment of a mine or quarry,

(d) the opening up, operation or abandonment of a pit or of a waste disposal site or land fill site,

(e) the conduct of exploration operations,

(f) any other operation or activity designated as a regulated surface operation under Part 2, or

(g) the construction, operation or abandonment of an extra-territorial undertaking.

(2) In this section "extra-territorial undertaking" means that portion of

(a) a pipeline as defined in the National Energy Board Act (Canada)

6. Regulations – Section 38

(1) The Lieutenant Governor in Council may make regulations

- (a) exempting from the operation of this Part
  - (i) any class of wells, pipelines, transmission lines or telecommunication lines, or
  - (ii) wells, pipelines, transmission lines or telecommunication lines, or any class of them, in any area of Alberta;
- (b) prescribing the manner in which any class of lands to which this Part applies must be conditioned, maintained and reclaimed;
- (c) prescribing the manner in which any kind of operation or activity enumerated in section 35 is to be conducted for purposes in connection with or incidental to the conditioning, maintenance or reclamation of the surface of land;
- (d) prescribing standards or criteria to be used by the Council to determine whether any land is conditioned, maintained or reclaimed in a satisfactory manner;
- (e) prescribing the circumstances under which an inquiry may be conducted by the members of the Council other than those appointed by local authorities and the procedures to be followed at those inquiries;
- (f) providing for procedures respecting the giving of prior notice of inquiries by the Council to the parties concerned;
- (g) providing for procedures in respect of reviews by the Council under Section 58;
- (h) providing the procedures in respect of appeals to the Court of Queen's Bench under this Part.

(2) Regulations under this section may apply generally or may make different provisions with respect to different parts of Alberta or different classes of land.

7. Reclamation Standards – Section 39

Subject to this part, the conditioning, maintenance and reclamation of the surface of land to which this part applies shall be performed in accordance with the regulations made pursuant to Section 38 or in the absence of those regulations or any applicable regulations, in a manner satisfactory to the Council.

8. Reclamation Orders – Section 42

(1) When the Council is authorized to make a reclamation order under this Part, the order may direct the performance of any work that is necessary in the opinion of the Council to do any or all of the following in respect of the land that is the subject of the inquiry by the Council:

- (a) subject to subsection (3), to condition, maintain or reclaim the land or any part of it and land adjacent to it,
- (a.1) to prevent, contain, control, remove or remedy any contamination, degradation or deterioration of the surface of the land,
- (a.2) to remove and conserve topsoil,
- (b) to destroy or prevent the growth of noxious weeds or weed seeds,
- (c) to remove or remedy any hazard to human life, domestic livestock or wildlife, or to the conduct of agricultural or other operations or
- (d) to install or repair any fence, gate, cattle guard, culvert or other thing.

(2) A reclamation order shall specify the date by which the work is to be completed.

(3) Where the regulations prescribe criteria or standards for, or the manner of carrying out, the conditioning, maintenance or reclamation of the land, the reclamation order shall be in accordance with the regulations.

(4) A reclamation order shall be directed to the operator concerned.

9. Reclamation of Abandoned Operations – Section 47

(1) The Council may hold an inquiry in respect of any land when

(a) prior to June 1, 1963, the land was held for purposes incidental to or in connection with

(i) the drilling, operation or abandonment of a well,

(ii) the construction, operation or abandonment of a pipeline or battery, or

(iii) the opening up, operation or abandonment of a mine or quarry,

and the surface lease or right of entry order under which the land was held was surrendered or terminated prior to June 1, 1963;

(b) prior to August 15, 1978, the land was held for purposes incidental to or in connection with the construction, operation or abandonment of a transmission line and the surface lease or right of entry order under which the land was held was surrendered or terminated prior to August 15, 1978;

(c) prior to August 15,1978, the land was used or held for purposes incidental to or in connection with any or held for purposes incidental to or in connection with any kind of operation or activity enumerated in Section 35 (1)(d) to (g) and the operation was abandoned or ceased to be conducted prior to August 15, 1978.

(2) When an inquiry is held pursuant to subsection (1), the Council shall make a report regarding the condition of the land and its recommendations with respect to the work necessary to condition, maintain or reclaim the surface of the land.

(3) A report under subsection (2) shall be submitted by the chairman to the Minister who may, having regard to the report,

(a) direct the Council to hold an inquiry under Section 43 with a view to issuing a reclamation order, when the Minister is satisfied that the identity of the operator is known and that the operator is still resident in Alberta, owns land in Alberta or, in the case of a corporation, is still carrying on business in Alberta, or

(b) in any other case, make an authorization under Section 48.

(4) When the Council holds an inquiry pursuant to a direction of the Minister under subsection (3)(a) the Council,

(a) if it issues a reclamation order directed to one operator but it considers that the operator is not entirely responsible for the reclamation, shall specify the proportions in which the cost of completing the work required by the order is to be borne by the operator and the Government, or

(b) in any case where it finds that 2 or more operators are wholly or partly responsible for the reclamation of the land, may issue a reclamation order directed to those operators, but in that case the order shall also specify

(i) the proportions in which the respective operators shall bear the cost of completing the work required by the order, if the Council finds the operators wholly responsible for the reclamation, or

(ii) the proportions in which the respective operators and the Government shall bear the cost, if the Council finds that the operators are only partly responsible for the reclamation.

(5) An order under subsection (4)(a) or an order under subsection (4)(b) that requires the Government to bear a portion of the cost of reclamation is not valid unless the Minister consents to the order, and in giving his consent, the Minister may, without any further hearing or inquiry, direct the Council to vary the order as to the apportionment and issue a new order accordingly.

(6) Any new order made under subsection (5) may extend the date by which the work is to be completed.

10. **Reclamation Certificates – Section 52**

(1) Notwithstanding anything in any other Act or in any surface lease or right of entry order

(a) no surrender of a surface lease is effective or binding on any person and

(b) no expropriation board shall order the termination of a right of entry order,

insofar as the surrender or termination relates to any interest of the owner, until a reclamation certificate has been issued in respect of the land affected by the surrender or termination.

11. **Appeal Reclamation Order or Certificate – Section 60**

(1) An owner or occupant of the surface of land with respect to which a reclamation certificate has been issued under Section 52 may appeal the issue of the certificate to the Court of Queen's Bench by filing a notice of appeal with the clerk of the court before the expiration of one year from the date of the mailing of the copy of the certificate to the applicant.

(4) The notice of appeal shall state

(a) the grounds of appeal;

(b) where appropriate the appellant's opinion of the actions that would constitute satisfactory reclamation;

(c) where the appeal from a reclamation order relates to an apportionment of costs, the appellant's opinion of what would constitute a proper apportionment.

(5) The appellant shall, within 20 days of filing the notice of appeal, serve a copy thereof on the secretary.

12. **Appeal to Court of Appeal – Section 63**

By leave of a judge of the Court of Appeal, a person may appeal from the judgment of the Court of Queen's Bench under section 59 or 60 to the Court of Appeal and the rules and practice applicable to appeals to the Court of Appeal apply.

A. Stop Order Appeal Regulations – Alberta Regulation 9/74

1. **Appeal – Section 3**

A person to whom a stop order is directed may, within 15 days after service upon him of a copy of the order, serve the Minister with an Appeal.

2. **Documents and Representations – Section 4**

The Minister shall, within 15 days after service upon him of an Appeal, refer the Appeal, the stop order to which it relates and any written documents or representations that he considers necessary or proper to the Authority.

3. **Hearing – Section 5**

(1) The Authority shall, as soon as reasonably possible, hold a hearing to inquire into all matters leading to the making of the stop order under appeal and determine whether, in its opinion, there were sufficient grounds for the making of the stop order in accordance with the provisions of the Act under which the stop order was made and in accordance with the provisions of The Administrative Procedures Act.

(2) Upon completion of the inquiry the Authority shall report its findings to the Minister together with any recommendations in regard to the confirmation, amendment or revocation of the stop order.

(Note: the Appeal Respecting Stop Order form is included as page A1 1-29 of this Appendix.)

B. Land Conservation Regulations – Alberta Regulation 125/74

Amended by 56/76, 113/77

These Regulations create and establish the following Committees and define their respective functions and authority:

Crown Mineral Disposition Review Committee,
Exploration Review Committee,
Development and Reclamation Review Committee.

Also defined in these Regulations are the particulars and details of the reports, documents, maps and plans required under the Regulated Surface Operations Regulations and described later in this synopsis.

1. Development Report - Section 25

A development report shall consist of an outline of an investigation into the impact of the proposed plan on alternate uses of land in the same location or in close proximity thereto, and shall normally include a discussion, as far as may be applicable, respecting

(a) residential development;
(b) aesthetic and scenic considerations;
(c) active or passive outdoor recreation areas;
(d) environmental considerations of indigenous flora and especially fauna;
(e) existing agricultural, commercial and industrial developments;
(f) proposed transmission and transportation facilities and the need for relocation of existing transmission or transportation facilities;
(g) housing requirements, if any, and related services, including
  (i) sewer,
  (ii) domestic water,
  (iii) electricity,
  (iv) telephone,
  (v) access roads,
  (vi) schools, and
  (vii) hospitals;
(h) such other details as may be required to provide an assessment depending on the nature of the site to be developed.

2. Surface Disturbance Report - Section 26

A surface disturbance report shall consist of a description of the development and its effects on the immediate surface environment and shall normally include particulars respecting

(a) any area to be cleared of vegetation;
(b) any vegetation to be cleared;
(c) any area in which any excavation or other physical disturbance of the surface will be made;
(d) any area in which any tailings, spoil or discard material will be deposited.

3. Geotechnical Engineering Report - Section 27

A geotechnical engineering report shall normally consist of a stability analysis for any loaded slope or overburden, tailings, spoil or discard piles or deposits based on the results of a foundation investigation and the properties of the material involved.

4. Surface Water Management Report - Section 28

(1) A surface water management report shall contain sufficient detail to permit evaluation of changes in water quality of the watershed area that is affected by the Development Plan and shall normally include

(a) engineering data and design details of
  (i) water flow control structures,
  (ii) water diversion structures,
  (iii) drainage structures, and
  (iv) erosion control and watershed protection structures, and
(b) information detailing the expected effects of the operation on the natural channel pattern of the area.

(2) Where flood plains are involved, the report shall normally include

- (a) a topographic plan of the site to be developed showing flood levels at various frequencies of which one shall be the 50 year frequency;
- (b) an engineering assessment on
  - (i) the probability of channel shifting in the flood plain, and
  - (ii) the danger from ice jam flooding;
- (c) the nature of water contaminants that could reach the river, stream or lake under conditions outlined in clause (a).

5. Ground Water Management - Section 29

(1) A groundwater management report shall contain sufficient detail to project water quantity estimates under various flow regimes and shall normally include

- (a) a geological report of the area, based on the results of exploratory drilling and excavation, including elucidation of the stratigraphy, lithology and structure of both overburden and bedrock;
- (b) a hydrogeological study of the proposed development area, including
  - (i) mapping of natural groundwater phenomena such as springs, seepage areas, phreatophytic vegetation, salt precipitates, and
  - (ii) determination of depth to water table, of piezometric water levels, and of water bearing zones;
- (c) chemical analysis of groundwater samples obtained during drilling or excavation, and from springs and seepage areas;
- (d) a groundwater resource evaluation by means of aquifer performance tests (pump tests);
- (e) groundwater regime parameters, with particular reference to
  - (i) groundwater in storage in the ground,
  - (ii) groundwater flow systems,
  - (iii) volumes of groundwater discharge, and
  - (iv) groundwater chemistry.

(2) Where groundwater aquifers are present, an evaluation will normally be required of the general effect of the proposed development on the groundwater regime, both during operations and after completion of reclamation.

6. Development Plan - Section 32

(1) A development plan shall include a map section containing maps and plates that illustrate the development and reclamation proposal being submitted, and shall normally include

- (a) location maps (on NTS 1:50,000 or other appropriate scale,) indicating locations of plants, areas of development, lease boundaries, roads and campsites;
- (b) topographic maps with suitable contours and including a mylar overlay showing
  - (i) details of permanent and temporary development, and
  - (ii) location of disposal sites, spoil or discard piles, overburden storage areas, road, residences, workshops, boundaries, pits, excavations, plants and cleared areas;
- (c) stereo, aerial photographs and aerial photograph mosaics on which the mylar overlay referred to in clause (b) can be overlaid to show
  - (i) major areas of disturbance and development to be established, and
  - (ii) the legal subdivisions or portions thereof which will be affected;
- (d) hydrologic diagrams showing drainage patterns including
  - (i) all water systems, including flood plains, where present, and
  - (ii) further plates, as are necessary, showing intended diversion schemes and indicating areas to be affected.

(2) All maps, photographs and diagrams included with a development plan shall by means of a scale bar indicate the scale used in their preparation.

7. **Reclamation Plan - Section 33**

(1) A reclamation plan shall normally consist of a description of

- (a) the time and sequence schedule for reclamation to be followed,
- (b) the physical and biological methods to be used in the reclamation, and
- (c) the final condition and subsequent use of the reclaimed site.

(2) Where the applicant proposes to create artificial water impoundments or leave open pits or excavations, the plan shall normally include

- (a) a long term stability analysis of any side, wall or slope based on the results of a foundation investigation, and
- (b) a safety analysis of any open pit or other excavation.

(3) Where revegetation is practicable, the plan shall normally include

- (a) results of chemical and physical analysis of soils and overburden strata to be used to establish vegetation,
- (b) types of vegetation to be used and the means of establishing vegetation,
- (c) where reforestation is planned, an indication of the number and type of seedlings which will be required and from where they will be obtained, and
- (d) the scheduling of revegetation and of the subsequent nurturing of new vegetation until it grows without further nurturing.

(4) The plan shall normally also include

- (a) plates illustrating complete reclamation for each stage showing all details, and
- (b) a landscape illustration showing the final features after total reclamation.

8. **Appeal Procedures – Section 35**

(1) An applicant for an Exploration Approval or Development and Reclamation Approval may, within 30 days of being advised in respect of his application by the Approving Authority for the application appeal to the Minister of the Environment

- (a) any terms or conditions of an Exploration Approval or Development and Reclamation Approval that is granted and that the applicant considers unreasonable, or
- (b) a refusal to grant an Exploration Approval or a Development and Reclamation Approval.

(2) On an appeal, the Minister of the Environment may

- (a) confirm or refuse the Approval in whole or in part, or
- (b) vary the Approval in whole or in part, or
- (c) direct the Approving Authority to issue an Approval upon such terms and conditions as the Minister may prescribe,

and the Minister's decision shall be final.

9. **Transfers and Amendments of Approvals – Section 42**

(1) No regulated surface operation in respect of which an Approval has been granted, shall, in whole or in part, without the written consent of the appropriate Approving Authority first being obtained,

- (a) be sold, or
- (b) be leased, or
- (c) be operated by any person other than the holder of the Approval.

(2) A holder of an Approval shall not, without first obtaining the written consent of the Approving Authority, enter into any agreement for a merger or amalgamation with any other person.

(3) An Approving Authority may revoke an Approval where there is a failure to comply with subsection (1) or (2).

C. Regulated Coal Surface Operation Regulations – Alberta Regulation 170/74

amended by 113/77

These regulations do not pertain to any field operation conducted by Industry.

D. Regulated Oil Sands Surface Operation Regulations – Alberta Regulation 159/76

amended by 113/77, 439/78

1. **Designation of Oil Sands Operations – Section 3**

(1) Pursuant to section 23 of the Act

- (a) the exploration for oil sands, and
- (b) the opening up, operation, alteration, extension or abandonment of any oil sands site

on any land within Alberta owned by the Crown in right of Alberta or by any other person, that occurs before and continues on or after, or is commenced on or after July 1, 1976, is hereby designated to be a regulated surface operation.

(2) Where the exploration for oil sands is a regulated surface operation and is being conducted on July 1, 1976, the operator shall on or before December 31, 1977, apply for and obtain an Exploration Approval therefor in accordance with Part 2.

(3) Where the opening up, operation, alteration, extension or abandonment of an oil sands site is a regulated surface operation and is being conducted on or before July 1, 1976, the operator shall on or before December 31, 1977, apply for and obtain a Development and Reclamation Approval therefor in accordance with Part 3.

2. **Exploration Approvals – Section 6**

(1) Before commencing any exploration for oil sands, the person proposing to do so shall make application for an Exploration Approval.

(2) An Exploration Application shall

- (a) be in Form 1 in the Schedule or such other forms as the Minister may from time to time prescribe and shall include or be accompanied by such information or plans as are prescribed in the Appendix to Form 1; (see Form 1 – Exploration Application included as pages A1-30 and A1-31 of this Appendix)
- (b) be prepared in 12 copies and sent (with the appropriate application, if any, required under the Oil and Gas Conservation Act) to

The Energy Resources Conservation Board
640 Fifth Avenue S.W.
Calgary, Alberta T2P 3G4

3. **Development and Reclamation Approvals– Section 9**

(1) Before commencing the opening up, operation, extension, or abandonment of an oil sands site, the person proposing to do so shall make application for a Development and Reclamation Approval.

(2) A Development and Reclamation Application shall

(a) be in Form 2 in the Schedule or such other form as the Minister may from time to time prescribe, and shall include or be accompanied by such additional information as the Minister may from time to time prescribe; (see Form 2 - Development and Reclamation Application included as page A1-32 of this Appendix)

(b) be prepared in 12 copies and sent (with the appropriate application required under the Oil and Gas Conservation Act) to

The Energy Resources Conservation Board
640 Fifth Avenue S.W.
Calgary, Alberta T2P 3G4

(5) The application shall, unless exemptions have been granted under Section 10, include

(a) Part 1 of a Development Plan as prescribed in Section 14; (of these regulations)

(b) Part 2 of a Development Plan consisting, as prescribed in Part 5 of the Land Conservation Regulations, insofar as may be applicable, of

(i) a development report;
(ii) a surface disturbance report;
(iii) a geotechnical engineering report;
(iv) a surface water management report;
(v) a groundwater management report;
(vi) such other or further particulars as the Chairman in any particular case may request.

(c) a reclamation plan as prescribed in Part 5 of the Land Conservation Regulations;

(d) maps and plans or sketches as prescribed in Part 5 of the Land Conservation Regulations.

4. **Development Plan – Part 1 – Section 14**

Part 1 of a Development Plan shall consist of

(a) a general descriptive outline of the proposed operation, including

(i) the estimated location, quality and quantity of the oil sands deposit to be developed,
(ii) the geological stratification showing the depth and type of overburden,
(iii) the projected thickness and geological location of the oil sands deposit,
(iv) the planned sequential rate of production,
(v) the overall duration of the operation,
(vi) the housing requirements, if any, and the estimated manpower requirements,
(vii) the potential impact on the environment, and
(viii) the economic feasibility of other types of operations;

(b) a detailed description of

(i) the procedures and equipment used to open up the oil sands site,
(ii) the proposed location of all overburden deposit or storage areas,
(iii) the procedures and equipment to be used in the extraction of crude bitumen,
(iv) the location of permanent access and haul roads,

(v) the location of each processing plant and the procedures to be used in processing of crude bitumen,

(vi) the procedures and equipment to be used in conveying crude bitumen from the oil sands site to each processing plant,

(vii) the location and nature of any tailings and discard deposits resulting from processing, and

(viii) the means of transporting synthetic crude oil and other products from each processing plant to the distribution transportation facility,

(ix) any other matters necessary or incidental to the operation;

(c) a sequential schedule of all activities in opening up, operation, abandonment and reclamation, including

(i) the timing for each stage and the sequence of activities, and

(ii) the concurrent activities of opening up, operation, abandonment and reclamation;

(d) a list of names and qualifications of the persons contributing to the development plan.

5. **Development Plan – Part 2 – Section 15**

Part 2 of a Development Plan shall, insofar as may be applicable, consists of reports, maps, plans and sketches named in Section 9, subsection (5), clause (b).

6. **Exemptions from Development Plan – Section 10**

In respect of a Development Plan an applicant may request the Chairman to be exempted from submitting any or all of the reports, maps, plans or sketches referred to in Section 9, subsection (5) and Section 14 that he considers to be inapplicable to or unnecessary in connection with the application, and the Chairman may grant an exemption.

7. **Reports to be filed with Director of Forestry – Section 16**

(1) An operator undertaking exploration for oil sands shall, at the conclusion of each exploration program, file with the Director a report on his program including a sketch or plan drawn to a scale indicated thereon by a scale bar and showing

(a) an outline of the area in which the oil sands exploration was undertaken and by reference to Section, Township, Range and Meridian

(b) the location of

(i) roads and trails that, in the course of the operation, were bulldozed or cleared but were not improved,

(ii) roads that, in the course of the operation, were bulldozed or cleared and were improved or fully constructed,

(iii) campsites and air landing strips, including helicopter pads, constructed during the course of the operation and their size in acres(hectares),

(iv) drill hole sites, excavations and trenches constructed during the operations, their size in acres(hectares) and

(v) detours and catwalks constructed during the course of the operation, and their lengths in feet(metres),

and their relationship to and distance, accurate within plus or minus 5 percent, from each other and from any roads or trails that existed at the commencement and were used in the course of the operation.

(2) A report under subsection (1) shall indicate the planned and completed reclamation of any lands used for or affected by the exploration program and shall be certified by the professional person in charge of the operation.

8. Reports to be Filed with Chairman of Land Conservation and Reclamation Council – Section 17

(1) An operator undertaking the opening up, operation, alteration, extension or abandonment of an oil sands site shall annually before March 31, and at the conclusion of his activities file with the Chairman two copies of a report on his activities during the preceding year, including

(a) a current air photo mosaic at a scale satisfactory to the Chairman showing the total area of the activities;

(b) the general progress of reclamation;

(c) a written report showing details of any

(i) timber salvage,
(ii) clearing operations,
(iii) new pits opened up,
(iv) tailings or discard deposit areas,
(v) sedimentation ponds or settling basins,
(vi) existing and proposed major access roads and trails, power lines, telecommunication lines and pipelines,
(vii) reservoirs and water diversions,
(viii) water crossings,
(ix) buildings constructed, and
(x) campsites and landing strips;

(d) photographs to supplement the written report.

(2) All reports shall contain such information as the Chairman may prescribe and be certified by the professional person responsible for the activities reported on.

E. Regulated Oil and Gas Pipeline Surface Operation Regulations – Alberta Regulation 207/76

1. Designation of Oil and Gas Pipeline Surface Operations – Section 2

(1) Pursuant to section 23 of the Act the construction, operation, alteration, extension or abandonment of any pipeline on any land within Alberta owned by the Crown in right of Alberta or by any other person, that occurs before and continues on or after, or is commenced on or after September 1, 1976, is hereby designated to be a regulated surface operation.

(2) Where the construction, operation, alteration, extension or abandonment of a pipeline is a regulated surface operation and is being conducted on September 1, 1976, the operator shall, on or before August 31, 1977, apply for and obtain a Development and Reclamation Approval therefor in accordance with Part 2.

(3) Where a regulated surface operation to which subsection (2) would otherwise apply was reviewed and approved before September 1, 1976, in a manner substantially similar to that prescribed in these regulations, the operation is deemed to have been reviewed in accordance with these regulations and the operator thereof is deemed to be the holder of a Development and Reclamation Approval in respect of the operation.

2. Development and Reclamation Approvals – Section 4

(1) Before commencing the construction, operation, alteration, extension or abandonment of a pipeline, the person proposing to do so shall make application for a Development and Reclamation Approval.

(2) A Development and Reclamation Application shall

(a) be in such form as the Minister may from time to time prescribe, and shall include or be accompanied by such additional information as the Minister may from time to time prescribe;

(b) be prepared in as many copies as may be required by and sent (with the appropriate application, if any, required under The Pipeline Act, 1975) to:

The Energy Resources Conservation Board
Pipeline Department
640 Fifth Avenue S.W. Calgary, Alberta T2P 3G4

(4) The application shall, insofar as may be applicable, but subject to Section 5, include:

(a) in all cases, Part 1 of a Development Plan consisting of

(i) the reports, maps, plans, sketches and other information prescribed under The Pipeline Act, 1975 and the regulations thereunder, and

(ii) a surface disturbance report as prescribed in Section 26 of the Land Conservation Regulations;

(b) when Section 6 applies, Part 2 of a Development Plan, consisting, as prescribed in Part 5 of The Land Conservation Regulations, of

(i) a development report;
(ii) a surface disturbance report;
(iii) a geotechnical engineering report;
(iv) a surface water management report;
(v) a groundwater management report.

3. **Development and Reclamation Approvals – Section 6**

(1) Part 2 of a Development Plan shall accompany an application where a pipeline is proposed or is located

(a) within 100 metres of the normal high water mark of a waterbody or watercourse as defined in the Land Conservation Regulations, or
(b) on a river floodplain, or
(c) on the slope of a watercourse, or
(d) within 100 metres of the upper break of a coulee, ravine or valley, or
(e) within a coulee, ravine or valley

(2) SubSection (1) applies where a pipeline is proposed to cross a waterbody, watercourse, river flood plain, coulee, ravine, or valley.

4. **Reports to be Filed with Chairman of the Land Conservation and Reclamation Council – Section 10**

(1) Upon the request of the Chairman at the conclusion of the construction, operation, alteration, extension or abandonment of a pipeline an operator shall file with the Chairman a report on his activities, including, in so far as may be applicable,

(a) a written report showing details of any

(i) right-of-way clearing activities;
(ii) access roads, power lines, telecommunication lines constructed in the course of the operations;
(iii) water crossings;

(b) a written description of reclamation performed;
(c) photographs to supplement the written report.

(2) All reports shall contain such other information as the Chairman may prescribe and be certified by the professional person responsible for the activities reported on.

F. Security Deposit Ministerial Regulations – Alberta Regulation 172/77

1. Security Requirement – Section 3

(1) An operator of a regulated surface operation shall give the security required by these regulations before the effective date of the Exploration Approval or Development and Reclamation Approval to which the security relates.

(2) An operator of a regulated surface operation shall give the additional security required by these regulations within 30 days of a demand therefor from the Minister.

2. Additional Security – Section 4

When the Minister fixes a single amount of security or additional security for all Exploration Approvals or all Development and Reclamation Approvals held by one operator, and the single amount of security or additional security is less or greater, as the case may be, than the total amount of security or additional security actually given by the operator to the Government,

(a) the operator shall give to the Government the amount required to make up the difference between the amount given and the amount required within the time set out in Section 3, or

(b) the Minister shall refund or return the excess to the operator,

as the case may be.

3. Exemption – Section 5

Notwithstanding any other provisions of these regulations, where the Minister in a particular case, having regard to the nature, complexity and extent of the regulated surface operation and the estimated cost of reclamation of the lands involved in an application for an Exploration Approval or Development and Reclamation Approval, deems it proper that the applicant for or the holder of the Exploration Approval or Development and Reclamation Approval should not be required to give security or additional security to the Government with respect to his regulated surface operation, the Minister may exempt the applicant or holder from giving security or additional security, as the case may be, to the Government.

FORM A
Appeal Respecting Stop Order

To: The Minister of the Environment
Government of the Province of Alberta
Legislative Building
Edmonton, Alberta

I, (we) ....
(full name or names of person(s) to whom stop order was directed)

....

....

of ....
(address in full)

hereby request that you cause a hearing to be held by the Environment Conservation Authority pursuant to the Stop Order Appeal Regulations and The Administrative Procedures Act to inquire into all matters leading to the making of a Stop Order numbered .... and dated .... and directed to me/us under the provisions of

The Department of the Environment Act
The Land Surface Conservation and Reclamation Act (Strike out inapplicable)
The Clean Air Act
The Clean Water Act

because ....

....

....
(state reasons for appeal)

Dated at .... this .... day of ...., 198 .....

FORM 1
THE REGULATED OIL SANDS SURFACE OPERATIONS REGULATIONS EXPLORATION APPLICATION

To the Energy Resources Conservation Board
640 Fifth Avenue S.W.
Calgary, Alberta T2P 3G4

. . . . , a body corporate
(name of applicant)

incorporated under the laws of . . . .

(or . . . .)
(occupation, if applicant is a natural person)

HEREBY MAKES APPLICATION for an Exploration Approval under the Regulated Oil Sands Surface Operations Regulations as described in the attached Exploration and Reclamation Plan commencing on

. . . .
(date)

on lands described as: . . . .
(describe all lands on which operations are

. . . .
proposed to be conducted and roads to be utilized)

The Post Office address of the Applicant is . . . .

. . . .

The application fee of $ . . . . is herewith enclosed.

Dated this . . . . day of . . . . , 19 . . . .

. . . .
(witness) (applicant)

NOTE: Affidavits of execution are required unless executed under corporate seal.

(See next page for Appendix to this application)

APPENDIX TO EXPLORATION APPLICATION

The Exploration and Reclamation Plan shall include, among other matters

(i) an outline of the area in which oil sands exploration will be undertaken,

(ii) the location, nature and extent of all existing and proposed access roads and trails,

(iii) the location, nature and extent of all water crossings,

(iv) the location, nature and extent of proposed surface disturbances with respect to exploration drillings, boring and excavations,

(v) the location, nature and extent of campsites and air landing strips,

(vi) the proposed deposit of surface material being disturbed,

(vii) the planned reclamation upon completion of the exploratory work, and

(viii) the name and address of the person or corporation responsible for the exploration and reclamation work if not conducted by the applicant.

Sketches and maps should, whenever possible, be appended for illustration.

Where lands included in the Exploration Application are lands to which the Geophysical Regulations, being Alberta Regulation 26/59 as amended from time to time or any regulations made in substitution therefor, apply, the Exploration Application shall, in respect of those lands, be accompanied by the plans, maps, reports and other documents prescribed in the Geophysical Regulations instead and in lieu of the particulars prescribed in clauses (i) to (viii) of this Appendix.

FORM 2
THE REGULATED OIL SANDS SURFACE OPERATIONS REGULATIONS DEVELOPMENT AND RECLAMATION APPLICATION

To the Energy Resources Conservation Board
640 Fifth Avenue S.W.
Calgary, Alberta T2P 3G4

. . . . , a body corporate
(name of applicant)

incorporated under the laws of . . . .

(or . . . .)
(occupation, if applicant is a natural person)

HEREBY MAKES APPLICATION for a Development and Reclamation Approval under the Regulated Oil Sands Surface Operations Regulations as described in the attached Development and Reclamation Plans, commencing on

. . . . (date)

on lands described as . . . .

. . . .
(describe all lands on which operations are proposed to be conducted)

The uses of lands adjacent to those on which the operation will be conducted are

. . . .

. . . .
(describe adjacent land and its uses)

. . . .

. . . .

The name and address of the person or corporation responsible for the development and reclamation work is:

. . . .
(Name in full, place of incorporation or occupation)

. . . .
(Street address)

. . . .
(City, etc.) (Province)

The Post Office address of the Applicant is . . . .

. . . .

The fee of $ . . . . is herewith enclosed.

Dated this . . . . day of . . . . , 19 . . . .

. . . .
(Witness) (applicant)

NOTE: Affidavits of execution are required unless executed under corporate seal.

A.1.16 THE LITTER ACT

The following excerpts from The Litter Act and corresponding Regulations are environmentally oriented and applicable to the oil and gas industry.

1. **Litter defined – Section 1**

   (d) "litter" means

   (i) any solid or liquid material or product or combination of solid or liquid materials or products, including, but not limited to

   (A) any rubbish, refuse, garbage, paper, package, container, bottle, can, manure, human or animal excrement or sewage or the whole or a part of an animal carcass,
   or

   (B) the whole or part of any artical, raw or processed material, motor vehicle or other machinery, that is disposed of,
   or

   (ii) any other material or product that is designated as litter in the regulations;

2. **Disposing defined – Section 1**

   (a) "disposing" includes discharging, dumping, throwing, dropping, discarding, abandoning, spilling, leaking, pumping, pouring, emitting or emptying, or any 2 or more of them, whether intentional or accidental;

3. **Litter on Public Land – Section 2**

   No person shall dispose of litter on public land unless he disposes of it

   (a) in a container placed for the purpose of collecting it, or

   (b) in accordance with The Forest and Prairie Protection Act and regulations made thereunder, and the regulations under this Act.

4. **Litter on Highways – Section 3**

   (1) No person shall dispose of litter on a highway, unless he disposes of the litter in a container placed for the purpose of collecting it.

   (2) No person shall transport litter in or on a motor vehicle or trailer on a highway, if the litter is likely to fall off or blow off the motor vehicle or trailer, unless the litter while being transported is adequately secured to prevent it from falling off, or adequately covered to prevent it from blowing off, the motor vehicle or trailer.

   (3) If litter is disposed of from

   (a) a motor vehicle other than a bus or taxi, or

   (b) a trailer,

   and it cannot be determined which of 2 or more occupants of the motor vehicle or trailer responsible, the driver of the motor vehicle shall be deemed to be the person who disposed of the litter from the motor vehicle or trailer.

   (4) If litter is disposed of from

   (a) a motor vehicle other than a bus or taxi, or

   (b) a trailer,

   and it cannot be determined who is the driver of the motor vehicle, the owner of the motor vehicle shall be deemed to the person who disposed of the litter from the motor vehicle or trailer, unless he proves to the satisfaction of a court that at the time of the offence the motor vehicle was not being driven, the trailer was not being towed or the motor vehicle or trailer was not parked or left by him or by any other person with his consent, express or implied.

   (5) In this Section, "litter", in addition to the meaning it has in Section 1 includes

   (a) coal, brick, wood, sawdust, gravel, earth or other material forming part of the load of a motor vehicle, and

   (b) glass or like materials, nails, tacks or scraps of metal.

5. **Litter on Municipally Owned Land – Section 4**

No person shall dispose of litter on any land owned by a local authority or owned by the Crown and Administered by the Minister of Municipal Affairs, unless he disposes of it

- (a) at a waste management facility established pursuant to the regulations made under The Public Health Act,
- (b) through a municipal refuse disposal system,
- (c) in a container placed for the purpose of collecting it,
- (d) by burning it
  - (i) in accordance with a permit, licence or approval issued by a local authority, or
  - (ii) pursuant to a permission given under the regulations made under The Clean Air Act, or
- (e) in any other manner specified in the regulations under this Act.

6. **Litter on Other Persons Land – Section 5**

No person shall dispose of litter on any land other than his own unless the owner or person in control of the other land agrees to its disposal.

7. **Litter in Water or on Ice – Section 6**

(1) No person shall dispose of litter on, into or under water or ice unless the litter is disposed of

- (a) pursuant to an approval or licence issued under The Clean Water Act or regulations thereunder,
- (b) pursuant to an approval issued under the Public Health Act or regulations thereunder, or
- (c) pursuant to a method or in a manner specified in the regulations under this Act.

8. **Offence and Penalties – Section 7**

(3) An enforcement officer who has reason to believe that a person has contravened Section 2,3,4,5 or 6 may

- (a) issue an anti-litter order to that person in the form specified in the regulations, or
- (b) commence a prosecution against that person,

with respect to the contravention.

9. **Unsightly Property Defined – Section 8**

- (c) "unsightly property" means any property or part of it on which there is litter which causes the property or any part of it to look unsightly.

10. **Clean Up Order – Section 9**

(1) Subject to Section 13, if an enforcement officer considers any property, when viewed from a highway, to be unsightly property, the enforcement officer may issue a clean up order.

(2) The clean up order shall be issued to

- (a) the owner, or
- (b) the person in control,

of the property that is the subject of the clean up order.

(3) The clean up order may require the person to whom it is addressed, within a period of time which shall not be more than 60 days from the date of the making of the order,

- (a) to remedy the condition of the property in a manner and to the extent directed in the order,
- (b) to demolish or remove any litter causing or contributing to the unsightliness of the property,
- (c) to construct any thing to prevent the property from being viewed from a highway,

(d) to do any other thing to remedy the unsightliness of property, or
(e) to do all or any of the matters specified in clauses (a) to (d).

A. Litter Control Regulations – Alberta Regulation 88/73

The litter control regulations include the "Anti-Litter Order" (Form A) and the "Clean-Up Order" (Form B) which have been reproduced on pages A1-35 and A1-36 of this Appendix.

FORM A
ANTI-LITTER ORDER

TO ....

OF ....

TAKE NOTICE THAT
Pursuant to Section 7 of THE LITTER ACT you are hereby ordered to correct or nullify your action of unlawfully disposing of litter.

This corrective action must be completed within .... days or a summons may be issued with regard to the offence. Dated this .... day of .... 19 ......

....
(Enforcement Officer)(rank)(force)

FORM B
CLEAN UP ORDER

TO . . . .
(name)

OF . . . .
(address)

TAKE NOTICE THAT

Pursuant to Section . . . . of THE LITTER ACT, the property located at . . . .
(address or legal description)
is considered to be unsightly by reason of litter thereon.

You are hereby ordered to remedy the unsightly condition of the above property by . . . .

If the above requirements are not met within . . . . days of the date of this order the work may be done by government crews and the costs of the work done becomes a debt owing the Crown by you.

This clean-up order may be reviewed by the Minister of the Environment if a written request for a review is made within 21 days of the date shown below to:

Minister of Environment
Legislative Building
Edmonton, Alberta.

Dated this . . . . day of . . . . , 19 . . . . .

. . . .
(Issuing Officer)

A.1.17 THE MIGRATORY BIRD ACT

Federal Govermnent of Canada Act.

(All birds are protected which traverse Provincial and Federal boundaries.)

A.1.18 THE MINES AND MINERALS ACT

This Act generally covers the terms and conditions of the disposition of minerals within the Province. While the application of the Act specifically excludes the drilling and production of wells, Part 9 has certain environmental implications as follows:

1. **Geophysical Exploration – Section 150**

   In this Part,

   (a) "approved exploration program" means a program of exploration under a preliminary plan for the program approved under the regulations;

   (b) "exploration" means any operations on or over land or water to determine geologic or other conditions underlying the surface of land or water, but does not include any kind of operation exempted from this Part by the regulations;

   (c) "exploration approval" means an approval under the regulations of a preliminary plan for a program of exploration;

   (d) "exploration equipment" means any equipment used or employed in exploration but does not include any type of equipment exempted from the provisions of this Part by the regulations;

   (e) "exploration licence" or "licence" means a licence to conduct exploration issued pursuant to the regulations;

   (f) "exploration permit" or "permit" means a permit to operate exploration equipment issued pursuant to the regulations;

   (g) "licensee" means the holder of an exploration licence;

   (h) "permittee" means the holder of an exploration permit.

2. **Licence for Geophysical Exploration– Section 151**

   (1) No person shall conduct exploration in Alberta unless

   (a) he is the holder of an exploration licence or is a person authorized by a holder to conduct exploration on his behalf, and

   (b) the exploration is conducted under an approved exploration program.

   (2) No person shall operate exploration equipment in Alberta unless he is either

   (a) the holder of an exploration permit, or

   (b) a person authorized by a permittee to operate exploration equipment under that permittee's permit,

   and the permit under which he is operating is not suspended and no other suspended permit exists with respect to that equipment.

A. Exploration Regulation – Alberta Regulation 423/78

1. **Definitions – Section 1**

   In this regulation

   (a) "Act" means The Mines and Minerals Act;

   (a.1) "approved plug" means a hole plug approved by the Minister;

   (b) repealed AR 30/87 s2;

   (b.1) "cut line" means a cut line made in the course of exploration and includes tailspreads;

   (c) "Department" means the Department of Energy;

(c.1) "Director of Surveys" means the Director of Surveys appointed under The Surveys Act;

(d) "district highway engineer" means a district highway engineer of the Department of Transportation for a highways district;

(d.1) "energy source" means a power source that is used to generate a pulse for the purpose of obtaining exploration data;

(e) "exploration" means any operations on or over land or water to determine geologic or other conditions underlying the surface of land or water but does not include operations exempted from Part 10 of the Act by Section 2(1);

(e.1) "exploration approval" means an approval under this regulation of a preliminary plan;

(f) "exploration licence" or "licence" means a licence to conduct exploration issued pursuant to this regulation;

(f.1) "exploration permit" or "permit" means a permit to operate exploration equipment issued pursuant to this regulation;

(g) "Exploration Review Committee" means the committee established under the Land Conservation Regulations under The Land Surface Conservation and Reclamation Act;

(g.1) "final plan" means the final plan for an approved exploration program;

(h) "Green Area" means that part of Alberta shown outlined and coloured green on the map annexed to a ministerial order dated May 27, 1986 and made pursuant to Section 10 of the Public Lands Act;

(h.1) "highway" means

- (i) an existing highway designated as a primary highway under The Public Highways Development Act, or
- (ii) an existing highway designated as a secondary road pursuant to The Public Highways Development Act, if the road is numbered in the 900 series pursuant to regulations under that Act is under the direction, control and management of the Minister of Transportation;

(i) "hole" means a shot or test hole;

(i.1) "inspector" means

- (i) an employee of the Department designated by the Minister as an exploration inspector for the purpose of this regulation,
- (ii) a forest officer appointed under Section 2 of the Forests Act, or
- (iii) an inspector appointed under Section 5 of the Public Lands Act;

(j) "licence of occupation road" means a road held under a licence of occupation granted pursuant to the Public Lands Licence of Occupation Regulations under The Public Lands Act;

(j.1) "licensee" when used in relation to a program of exploration, means the holder of the licence under which the program of exploration was or will be conducted;

(k) "Minister" means the Minister of Energy;

(k.1) "occupied public lands" means the surface of lands of the Crown in right of Alberta that are the subject of a disposition under The Public Lands Act, The Special Areas Act or otherwise that conveys an estate or interest sufficient to enable the holder of the disposition to exclude persons from entering upon the lands, but does not include a leased road allowance;

(l) "owner", with reference to land other than Crown land, means

- (i) a person who has a life estate in the land notice of which appears on the certificate of title to the land or in respect of which a certificate of title has been issued,

(ii) in the absence of a person described in subclause (i), the purchaser of the fee simple estate in the land under an agreement for sale that is the subject of a caveat registered against the certificate of title to the land, or

(iii) in the absence of persons described in subclauses (i) and (ii), the person registered under The Land Titles Act as the owner of the fee simple estate in the land;

(l.1) "permittee", when used in relation to a program of exploration, means the permittee who operates or who authorizes the operation of the exploration equipment used in the conduct of the program of exploration;

(m) "preliminary plan" means a preliminary plan for a program of exploration;

(m.1) "public lands" means lands of the Crown in right of Alberta, but does not include mines and minerals or a highway or public road;

(n) "public road" means

(i) a road or road allowance subject to the direction, control and management of a municipal corporation or a Minister of the Crown in right of Alberta,

(ii) any other public road owned by the Crown,

(iii) a licence of occupation road, or

(iv) a right of entry road,
but does not include a highway;

(o) "reviewing authority" means an offical or department to whom an application for an exploration approval is referred pursuant to Section 12(2);

(p) "right of entry order" means a right of entry as defined in The Surface Rights Act;

(q) "right of entry road" means a road that is the subject of a right of entry order if the order affects unoccupied public lands and contains a condition to the effect that the operator under the order must permit a specified person or class of persons to use the road;

(r) "road allowance" means a road allowance as prescribed under The Surveys Act, whether containing an existing thoroughfare or not;

(s) "shot hole" means a hole drilled or being drilled or a trench made or being made for the purpose of detonating an explosive charge for the primary purpose of obtaining geophysical information;

(t) "surface material" means clay, marl, sand, gravel or peat;

(u) "Surface Materials Committee" means the Surface Materials Committee appointed pursuant to Section 2(2) of the Surface Materials Regulations under The Public Lands Act;

(v) "survey monument" or "monument" means a post, stake, pin, mound of rock or other material, pit, trench or any other thing used to mark

(i) the surveyed corner of a quarter Section or a Section, or a witness post indicating the position of that corner, or

(ii) a triangulation point;

(w) "tailspread" means tailspread as that expression is understood in the exploration industry;

(x) "test hole" means a hole drilled or being drilled to a depth of 500 feet or less for the primary purpose of obtaining geological information and in which no explosive charge will be detonated but in which logs may be run;

(y) "White Area" means that part of Alberta not within the Green Area;

(z) repealed AR 30/87 s2.

2. **PART 1 - General- Section 2**

(1) The following kinds of operations are exempted from the provisions of Part 10 of the Act:

(a) the investigation of the subsurface of land or water solely by exploration equipment mounted in or attached to aircraft in flight;

(b) an investigation or examination of the surface of land and the taking of surface samples with hand tools by a person

(i) who travels on foot or in a vehicle on a previously established road or trail or on an existing cut line, and

(ii) who does not, in the course of the investigation or examination, camp or occupy a tent, trailer or other shelter at any location for a period exceeding 14 days;

(c) the drilling to a depth in excess of 500 feet of an exploratory hole as defined in the Coal Conservation Regulations under The Coal Conservation Act;

(d) the drilling of a well for which a licence is required under The Oil and Gas Conservation Act;

(e) any operations conducted to determine the presence of water;

(f) any investigation of the subsurface to evaluate the extent, quality and nature of known coal deposits in land within that portion of the area of a licence granted under The Coal Conservation Act, that is the subject of a disposition or right of entry order granting the right to use the surface of land, if that investigation is conducted by or on behalf of the person to whom the licence is granted;

(g) any investigation of the subsurface, including step-out drilling, to evaluate the extent, quality and nature of known oil sands deposits within the area of an approval granted under Section 31 of the Oil and Gas Conservation Act, that is the subject of a disposition or right of entry order granting the right to use the surface of land, if that investigation is conducted by or on behalf of the person to whom the approval was granted;

(h) the drilling of a hole to determine soil stability.

(2) The following types of equipment are exempted from provisions of Part 10 of the Act:

(a) passenger vehicles used by supervisory personnel;

(b) trailers;

(c) aircraft.

3. **General - Section 3**

(1) No person shall conduct exploration on

(a) land owned by a person other than the Crown, except with the consent of the person having lawful possession of the land or that person's agent;

(b) land owned or occupied by the Crown in right of Canada, except with the consent of the appropriate department or agency of the Government of Canada or of a person authorized by the appropriate department or agency to give the consent;

(c) land within the boundaries of a city town or village, except with the consent of the city, town or village concerned;

(d) occupied public lands, except with the consent of the holder of the disposition to which the lands are subject or his agent;

(e) a part of a highway or public road that is under construction except with the consent of the district highway engineer or other person in charge of the construction;

(f) public lands under the administration of a Minister of the Crown in right of Alberta other than the Minister, the Associate Minister or the Minister of Municipal Affairs, except with the consent of the Minister having the administration of those lands;

(g) public lands under the administration of a corporation that is an agent of the Crown in right of Alberta, without the consent of that corporation;

(h) land within a Metis colony constituted under The Metis Betterment Act, except with the consent of the settlement association council and the director of the Metis Development Branch of the Department of Social Services and Community Health;

(i) a closed road allowance in a special area, except with the consent of the Special Areas Board and then only upon any conditions prescribed by that Board.

(2) Notwithstanding **subsection** 1(a), where

(a) the exploration to be conducted on any land other than Crown land entails the cutting of trees or the commission of waste on the land, and

(b) the person in lawful possession does not have the right to cut trees or commit waste, as the case may be, on that land,

no person shall conduct the exploration on that land except with the consent of the owner who has that right or his agent.

(3) Subsections (1) and (2) shall not be construed as removing the necessity to obtain a consent to conduct exploration on any land from any person not referred to in those subsections, if that person's consent is required by law.

4. General - Section 4

(1) No exploration entailing the drilling of holes shall be conducted on land in the Exploration Restricted Areas described in Schedule A to this regulation.

(2) If any discrepancy exists between a description of an Exploration Restricted Area in the Schedule and the map following the description, the description prevails.

(3) No exploration entailing the drilling of holes or the use of explosives shall be conducted on land within the area of a licence for an underground mining operation granted by the Energy Resources Conservation Board pursuant to The Coal Conservation Act.

5. General - Section 5

(1) No person shall conduct a type of exploration within an area while that method of exploration is prohibited in that area by an order of the Minister of the Environment under Section 10 of The Land Surface Conservation and Reclamation Act.

(2) No person shall conduct exploration on land within a Restricted Development Area or Water Conservation Area established by regulation under Section 16 of the Department of the Environment Act, where the use of the land in the Area for exploration is prohibited by a regulation under Section 16 or 18 of that Act.

(3) No person shall conduct exploration on land within a special planning area established by regulation under Section 150 of the Planning Act, where the use of land in that area is prohibited by a regulation under that Section.

6. General - Section 6

(1) For the purposes of Section 156 of the Act,

(a) the maximum penalty for a contravention of Section 151 of the Act is **$10 000**;

(b) the maximum penalty for a contravention of any of the following provisions of this regulation is the amount shown opposite that provision:

Section 3(1)	$1000
Section 4	$1000
Section 5	$1000
Section 17	$ 500
Section 18(2)	$2000
Section 19(1)	$1000
Section 23	$2000
Section 24	$2000
Section 25	$ 500

Section 26	$ 100
Section 27(1)or(2)	$1000
Section 33	$2000
Section 34	$ 500
Section 36	$ 500

(c) the maximum penalty for a contravention of any of the following provisions of this regulation, for each day on which the contravention occurs, is the amount shown opposite that provision:

Section 30	$5000
Section 31	$1000
Section 32	$ 500

(d) the maximum penalty for a failure to comply with any condition of an exploration approval, licence or permit is $5000.

7. **PART 2 – Licences and Permits - Section 7**

An application for an exploration licence or an exploration permit shall be made to the Minister by submitting it to the Minister at the address specified by him.

8. **Licences and Permits - Section 8**

(1) An application for an exploration licence or an exploration permit shall be accompanied by

(a) a fee of $50, and

(b) a deposit in the sum of $1000 as a guarantee that the application will comply with Part 10 of the Act and this regulation and the conditions of each exploration approval issued to him.

(2) Subsection (1)(b) does not apply if the exploration to be conducted by the applicant relates solely to the determination of the presence or extent of a surface material.

(3) The deposit may be returned to the applicant if the exploration licence or exploration permit is not issued.

(4) The deposit may be refunded to a licensee or permittee where the Minister cancels a licence or permit

(a) which was issued in error, or

(b) at the request of the licensee or permittee,

and the Minister is satified that the licensee or permittee, as the case may be, or any person performing any operation or function under the authority of the licence or permit, has complied with this regulation and the terms and conditions of the exploration approvals issued to him.

(5) If all or part of the deposit furnished under this Section is expended by the Minister pursuant to this regulation, the licensee or permittee, as the case may be, shall, on demand by the Minister, pay a sufficient amount of money to the Minister so that the deposit is again $1000.

9. **PART 3 – Exploration Approvals - Section 9**

For the purpose of this regulation, the holder of an Exploration Approval under

(a) the Regulated Oil Sands Surface Operation Regulations under The Land Surface Conservation and Reclamation Act, or

(b) the Regulated Coal Surface Operation Regulations under that Act,

is deemed to be the holder of an exploration approval for the same program of exploration under this regulation, without the necessity of applying for the approval, and the program is deemed to be an approved exploration program.

10. Exploration Approvals - Section 10

An application to the Minister for an exploration approval shall consist of a preliminary plan which shall be submitted in quadruplicate by the licensee for the program to the Minister at the address specified by him.

11. Exploration Approvals - Section 11

(1) Subject to subsection (2), the preliminary plan shall contain a map on a scale of 1:50000, or any other scale approved by the Minister,

(a) showing the location of

(i) the area that will be explored by reference to Sections, townships, ranges and meridians;

(ii) public roads and other roads and trails that will be used to gain immediate access to the area that will be explored;

(iii) existing cut lines in the immediate vicinity of the area to be explored on or from which the licensee for the program has previously obtained exploration data;

(iv) existing cut lines that will be utilized to acquire data during the conduct of the program of exploration or to gain access to the area to be explored;

(v) new cut lines proposed to be cut during the conduct of the program of exploration to acquire data or gain access to the area to be explored;

(vi) campsites and landing strips proposed to be constructed or used during the conduct of the program of exploration;

(b) identifying by number or letter cut lines on which exploration data is to be acquired during the conduct of the program of exploration for which the preliminary plan is being filed;

(c) identifying any mineral or minerals being explored for and the method of exploration to be employed;

(d) showing the name, address and licence number of the licensee who will conduct or authorize the conduct of the exploration to be undertaken in the proposed program of exploration;

(e) showing the name, address and permit number of the permittee who will operate or authorize the operation of exploration equipment to be used in the program of exploration;

(f) stating whether the exploration equipment to be used in the program of exploration will be tracked or wheeled;

(g) stating the expected date of commencement of, and of completion of recording under, the proposed program of exploration.

(2) The preliminary plan for a program of exploration for a surface material shall consist of a map on a scale of 1:50000, or any other scale approved by the Minister,

(a) showing the location of

(i) the area that will be explored by reference to Sections, townships, ranges and meridians;

(ii) public roads and other roads and trails that will be used to gain immediate access to the area that will be explored;

(iii) existing cut lines that will be utilized to acquire data during the conduct of the program of exploration or to gain access to the area to be explored;

(iv) new cut lines proposed to be cut during the conduct of the program of exploration to acquire data or to gain access to the area to be explored;

(b) identifying sites or locations at which exploration data is to be acquired during the conduct of the program of exploration for which the preliminary plan is being filed;

(c) stating the surface material being explored for, the method of exploration to be employed and the estimated dimensions of any excavation;

(d) showing the name, address and licence number of the licensee who will conduct or authorize the conduct of the exploration to be undertaken in the proposed program of exploration;

(e) stating the expected date of commencement of, and of completion of, the proposed program of exploration.

12. **Exploration Approvals - Section 12**

(1) Except as provided in subsection (2) and Section 13, every application for an exploration approval shall be reviewed by the Minister.

(2) The Minister shall refer an application for an exploration approval

(a) repealed AR 30/87 s3;

(b) to the Director of the Land Management and Development Branch of the Public Lands Division of the Department for reviews, if the exploration program will involve the use of public lands in the White Area or Yellow Area;

(c) to the Department of the Environment for review, if the exploration program will involve the use of

(i) the bed or shore of a permanent watercourse or water body, or

(ii) land within one kilometre of a dam.

(3) In subsection (2)(c),

(a) "dam" means a barrier constructed for the purpose of storing water or water containing any other substance, and

(i) that has a storage capacity of 60000 cubic metres or more, or

(ii) that is 8 metres or more in height when measured to the top of the barrier,

(A) from the natural bed of the watercourse at the downstream toe of the barrier, in the case of a barrier across a watercourse, or

(B) from the lowest elevation at the outside limit of the barrier, in the case of a barrier that is not across a watercourse,

and includes works incidental to, necessary for, or in connection with the barrier;

(b) "permanent watercourse or water body" means

(i) a river or stream greater than 15 metres in width measured from the normal high water marks, or

(ii) a lake greater than 5 hectares in size capable of supporting fish population throughout the year.

(4) The Minister or a reviewing authority shall, in conducting a review of an application, consult with a department or agency of the Government, where the Minister or the reviewing authority, as the case may be, is satisfied that the proposed exploration program directly concerns any statute, regulation, service or program administered by that department or agency.

(5) Subject to Sections 13 and 14,

(a) a review under this Section of an application shall be completed, and

(b) the applicant shall be informed as to whether his application has been approved or refused or referred to a committee pursuant to Section 13,

not later than the expiry of the period of 10 working days commencing on the day on which the application was received by the Minister at the address specified by him.

13. **Exploration Approvals - Section 13**

(1) When requested to do so by a reviewing authority, the Minister may refer an application for an exploration approval

(a) to the Surface Materials Committee for review, if the exploration program involves exploration for a surface material, or

(b) to the Exploration Review Committee for review, in any other case,

and in either case the applicant shall, subject to Section 12(5)(b), be immediately informed of the referral.

(2) When the Exploration Review Committee or Surface Materials Committee has completed its review of the application, the application and the Committee's recommendations shall be forwarded to the Minister at the address specified by him.

(3) Subject to Section 14,

(a) a review under this Section of an application shall be completed, and

(b) the applicant shall be informed as to whether his application has been approved or refused,

not later than the expiry of the period of 30 days commencing on the day on which the application was received by the Minister at the address specified by him.

14. Exploration Approvals - Section 14

(1) Where an application for an exploration approval is refused by reason of deficiencies in it,

(a) the applicant shall be informed of the deficiencies, and

(b) the applicant may resubmit the application, with the deficiencies corrected, to the Minister at the address specified by him.

(2) An application resubmitted pursuant to subsection (1)(b) shall be treated as the inital application for the purposes of Sections 12 and 13.

15. Exploration Approvals - Section 15

(1) Where an application for exploration approval relates to a program of exploration on public lands in the Green Area, a copy of the application shall be submitted by the applicant

(a) to the forest superintendent of the forest in which the exploration will be conducted, and

(b) to the senior forest officer for the ranger district of that forest in which all or most of the exploration will be conducted,

concurrently with the submission of the application to the Minister.

(2) Where an application for exploration approval relates to a program of exploration on public lands under the administration of the Minister of Forestry, Lands and Wildlife in the White Area, a copy of the application shall be submitted by the applicant to the district supervisor of the Public Lands Division concurrently with the submission of the application to the Minister.
AR 423/78 s15; 30/87

16. Exploration Approvals - Section 16

(1) Where the Minister requests a security deposit in respect of a program of exploration, it is a condition of the granting of the exploration approval that the applicant, within the 30-day period following the day on which the request was made, furnishes to the Government a security deposit

(a) in an amount and form prescribed for the program of exploration by the Minister, and

(b) made payable to the Provincial Treasurer.

(2) In assessing the need for and fixing the amount of a security deposit under subSection (1), the Minister shall have regard to the content, circumstances and nature of the program of exploration and the location of the area to be explored.

(3) Where a security deposit prescribed by the Minister under subsection (1) is not furnished within the 30-day period, the Minister shall refuse to grant the exploration approval.

(4) Where, in the opinion of the Minister, an approved exploration program for which a security deposit has been furnished under subSection (1) is not being conducted in compliance with this regulation or the conditions of the exploration approval,

(a) the Minister may declare the security deposit forfeited to the Government,

(b) the Government may expend on the location of the approved exploration program such portion of the security deposit as is necessary to remedy the non-compliance, and

(c) when the Minister is satisfied that the non-compliance has been remedied and the licensee is not otherwise in default of compliance with this regulation or the conditions of his exploration approval in relation to the approved exploration program, refund to the licensee any remaining portion of the security deposit not expended under clause (b).

17. Exploration Approvals - Section 17

(1) Where a licensee intends that an approved exploration program be conducted by a permittee under his authorization, he shall deliver a copy of the exploration approval to the permittee prior to the commencement of the exploration program.

(2) The permittee shall furnish a copy of the exploration approval to the crew operating equipment in the conduct of the approved exploration program, and the copy shall be kept at the field headquarters of the crew until the program is completed.

18. Exploration Approvals - Section 18

(1) Subject to **subsection** (2), an exploration approval expires on the 30th day of April next following upon the date on which it was granted, or, if before that date a time extension is granted by the Minister, at the end of that time extension.

(2) Upon the completion of exploration field operations under an approved exploration program, the exploration approval is deemed to have expired and no person shall repeat any of those operations or conduct any similar operations under that program.

19. Exploration Approvals - Section 19

(1) Within 60 days after complection of the exploration field operations under an approved exploration program, the licensee to whom the exploration approval was issued shall with the Minister at the address specified by him,

(a) a final plan for the approved exploration program in quadruplicate, and

(b) either

(i) a copy of every log of each test hole logged during the course of conduct of the approved exploration program, together with all pertinent data, or

(ii) a letter indicating that no test holes were logged during the conduct of the approved exploration program.

(2) Subject to **subsection** (3), the final plan shall consist of a map on a scale of 1:50000, or any other scale approved by the Minister,

(a) showing the location of

(i) the area that was explored by reference to Sections, townships, ranges and meridians;

(ii) public roads and other roads that were used to gain immediate access to the area that was explored;

(iii) existing cut lines that were utilized to acquire data during the conduct of the approved exploration program;

(iv) new cut lines that were cut during the conduct of the approved exploration program for the purpose of acquiring data or gaining access to the area that was explored;

(v) detours constructed for exploration equipment during the conduct of the approved exploration program and indicating their length in metres;

(vi) campsites and landing strips constructed or used during the conduct of the approved exploration program and the size of the campsites and landing strips;

(vii) stations or places at which samples or measurements were obtained or holes were drilled in the course of exploration, and

(viii) each shot hole and its number;

(b) showing the name, address and licence number of the licensee who conducted or authorized the conduct of the exploration carried out under the approved exploration program;

(c) showing the name, address and permit number of any permittees who operated or authorized the operation of exploration equipment used in the approved exploration program.

(3) The final plan for a program of exploration for a surface material shall consist of a map on a scale of 1:50000, or any other scale approved by the Minister,

(a) showing the location of

(i) the area that was explored by reference to Sections, townships, ranges and meridians;

(ii) public roads and other roads and trails that were used to gain immediate access to the area that was explored;

(iii) existing cut lines were utilized to acquire data during the conduct of the approved exploration program;

(iv) new cut lines that were cut during the conduct of the approved exploration program for the purpose of acquiring data or gaining access to the area that was explored, and their width;

(v) test sites at which samples or measurements were obtained in the course of exploration, the type of surface material removed from the sites, and the dimensions of those sites;

(vi) each test hole drilled in the course of exploration and its numbering with the number in each case corresponding to the number of the test hole shown in the logs submitted under subsection (1);

(b) showing the name, address and licence number of the licensee who conducted or authorized the conduct of the exploration carried out under the approved exploration program;

(c) showing the name, address and permit number of any permittees who operated or authorized the operation of exploration equipment used in the approved exploration program.

20. Exploration Approvals - Section 20

(1) Where the final plan submitted under Section 19 does not conform with subsection (2) or (3) of that Section, the Minister may by notice in writing

(a) require the licensee for the exploration program to submit any deficiencies in the final plan to the Department, or

(b) reject the final plan and require the licensee for the exploration program to resubmit a final plan that conforms with subSection (2) or (3), as the case may be, within the period prescribed by the Minister.

(2) The Minister shall be deemed to have approved a final plan on the date of its filing under Section 19(1) unless notice to the contrary is given by the Minister to the licensee for the exploration program within 90 days of the filing date.

(3) Any notice given under this Section by the Minister to the licensee for an exploration program shall be deemed to be served on the licensee at the time of its mailing.

(4) The Minister may grant an extension to the time prescribed for the filing of the final plan under subsection (1) if in his opinion the extension is warranted in the circumstances. Exploration Field Operations

21. **PART 4 – Exploration Field Operations - Section 21**

In this Part, "Director of Improvement Districts Administration" means the Director of the Improvement Districts Branch of the Department of Municipal affairs.

22. **Exploration Field Operations - Section 22**

Sections 24 to 27 and 30 to 35 do not apply to exploration for a surface material.

23. **Exploration Field Operations - Section 23**

No person shall

(a) conduct any exploration otherwise than in accordance with the approved exploration program authorizing the exploration, or

(b) in the conduct of exploration make any cut line or otherwise cut, destroy or damage any forest growth or other natural growth at a location not authorized by an approved exploration program.

24. **Exploration Field Operations - Section 24**

No person shall, in relation to anything described in the left-hand column of Schedule B to this regulation, conduct a method of exploration closer to that thing than the minimum distance shown opposite the description of that thing in that Schedule in the column for that method.

25. **Exploration Field Operations - Section 25**

(1) A permittee shall, in conspicuous letters and numbers not less than 10 centimetres high, mark on both sides of each unit of exploration equipment being operated by him or by a person under his authority the words "PERMIT NO". followed by the number of his permit.

(2) A unit of exploration equipment shall not be marked with more than one permit number.

26. **Exploration Field Operations - Section 26**

A permittee shall inform the Department of the location of, and shall inform the Department in advance of a change in the location of, the field headquarters of each crew authorized by the permittee to operate exploration equipment.

27. **Exploration Field Operations - Section 27**

(1) Before commencing a program of exploration in a municipal district, county or special area or in any part of an improvement district in the White Area or Yellow Area, the permittee for the program shall provide to the council of the municipal district or county or to the Special Areas Board or to the Director of Improvement Districts Administration, as the case may be, written notice of the commencement of the program and a copy of the approved preliminary plan for the program.

(2) Within 72 hours after the removal from a municipal district, county or special area or from an improvement district in the White Area or Yellow Area of all exploration equipment used to conduct a program of exploration in that municipal district, county special area or improvement district, the permittee for the program shall give written notice of the removal to the council of the municipal district or county or to the Special Areas Board or to the Director of Improvement Districts Administration, as the case may be.

(3) A written notice may be given under subsection (1) or (2)

(a) by leaving it at the office of the municipal secretary of the municipal district or county,

(b) by leaving it at the office of the secretary for the Special Areas Board, or

(c) by leaving it at or mailing it to the office of the Director of Improvement Districts Administration,

as the case may be.

28. **Exploration Field Operations - Section 28**

(1) Where a permittee or person authorized by him to operate exploration equipment causes damage to or the loss or destruction of any property related to a highway or public road, the permittee shall

(a) immediately discontinue those operations or activities associated with the program that caused the damaged, loss or destruction, and

(b) give notice of the damage, loss or destruction to

(i) the council of the municipality in the case of a highway or public road subject to the direction, control and management of the municipality,

(ii) the Special Areas Board, in the case of a public road situated in a special area, or

(iii) the district highway engineer in the case of a highway or public road subject to the direction, control and management of the Minister of Transportation,

and

(c) make arrangements for the repair or replacement of the property so damaged, lost or destroyed with the person to whom notice is required to be given under clause (b), or pay for or otherwise settle the damages arising from the damage, loss or destruction.

(2) In subsection (1), "property related to a highway or public road" or "property" means

(a) a bridge or culvert forming part of a highway or public road, or

(b) a sign, structure or traffic control device on the highway or public road and used in connection with the construction or maintenance of, or the control of traffic on, the highway or public road.

(3) This Section does not apply to licence of occupation roads or right of entry roads.

29. Exploration Field Operations - Section 29

(1) Where a survey monument is damaged, destroyed, moved or altered during the conduct of a program of exploration, the permittee for the program

(a) shall report the matter immediately to the Minister at the address specified by him,

(b) shall engage an Alberta land surveyor to restore, replace or re-establish the monument, and

(c) shall forward a copy of the surveyor's plan for restoration, replacement or re-establishment to the Minister at the address specified by him.

(2) If a survey monument referred to in subsection (1) is not restored, replaced or re-established to the satisfaction of the Minister, the Minister may

(a) engage an Alberta land surveyor to restore, replace or re-establish the monument,

(b) charge the permittee of the program for the expenses of the restoration, replacement or re-establishment, and

(c) recover any unpaid expenses for which the permittee has been charged from the permittee's deposit furnished under Section 8.

30. Exploration Field Operations - Section 30

(1) Subject to subsection (2), no energy source shall be operated on, no hole shall be drilled in, and no trench shall be made on, the right of way of a highway or public road except

(a) within that part of the right of way that is not closer to its travelled portion than one metre from the toe of the slope and not closer to an outer boundary of the right of way than one metre, or

(b) if the right of way does not contain a travelled portion, within that part of the right of way that is not closer to an outer boundary of the right of way than one metre.

(2) An energy source that does not cause surface damage may be operated on the travelled portion of

(a) a highway or public road subject to the direction, control and management of the Minister of Transportation, if the permittee for the program of exploration has obtained a permit from the Motor Transport Board;

(b) a public road subject to the direction, control and management of a municipal district or county, if the permittee for the program of exploration has obtained the consent of the council of the municipal district or county;

(c) a public road in a special area subject to the direction, control and management of the Minister of Municipal Affairs, if the permittee for the program of exploration has obtained the consent of the Special Areas Board;

(d) a licence of occupation road, if the permittee for the program of exploration has obtained the consent of the licence of occupation;

(e) a right of entry road, if the permittee for the program of exploration has obtained the consent of the operator under the right of entry order.

31. Exploration Field Operations - Section 31

A permittee or person operating exploration equipment with his authorization

(a) shall remove from the right of way of a highway or public road debris, refuse or other material resulting from the conduct of a program of exploration within the right of way;

(b) following abandonment of a hole drilled within the right of way of a highway or public road, shall spread all drilled mud and material from the hole not required for the abandonment over the ground surrounding the hole;

(c) shall not clear brush or trees on the right of way of a highway or a public road except on those parts of the right of way lying to the side of each shoulder but not closer than one metre to the boundary of the right of way.

32. Exploration Field Operations - Section 32

(1) Where water or gas is released from an aquifer or stratum and comes to the surface during or after the drilling of a hole

(a) the drilling of the hole shall be discontinued;

(b) no explosive charge shall be detonated in the hole;

(c) the hole shall be plugged without undue delay so as to confine the water or gas as to the aquifer;

(d) the permittee who has operated or authorized the operation of the exploration equipment used in drilling the hole shall forthwith in writing notify the Minister at the address specified by him of

(i) the release of water or gas

(ii) the location including co-ordinates of the hole,

(iii) the ground elevation at the hole,

(iv) the depth to each aquiferous or gas horizon encountered, and

(v) the remedial action taken to confine the water or gas, or if the hole is completed as a water well, the method of completion of the well.

(2) Notwithstanding subsection (1)(a) and (c), a hole flowing water may be completed as a water well only if

(a) the hole is not located on the right of way of a highway or public road,

(b) arrangements to do so have been made between the permittee who operated or authorized the operation of the exploration equipment to drill the hole and

(i) the person in possession of the land on which the hole is located or the owner, in the case of land other than Crown land, or their respective agents, or

(ii) the holder of the disposition or his agent, in the case of occupied public lands,

(c) the flow of water from the hole is completely controlled in accordance with the requirements of the regulations under The Ground Water Control Act relating to completed flowing wells, and

(d) the well when completed will not interfere with the rights of other persons.

33. Exploration Field Operations - Section 33

Unless otherwise provided in the conditions of the exploration approval, no hole which has not been permanently abandoned shall be left unattended

(a) until an approved plug is placed in the hole at a depth of 45 centimetres below the surface,

(b) until a permit tag is securely attached to the plug,

(c) until the hole is filled from the plug to the surface, and

(d) where the hole contains an explosive charge,

  (i) unless the charge has been placed in a sandpoint container,

  (ii) until sufficient earth is placed in the hole to secure the charge below the surface, and

  (iii) until any wires attached to the charge are concealed below the surface.

34. Exploration Field Operations - Section 34

(1) Before a drilling rig is removed from a hole, a permit tag shall be affixed

(a) in a position facing the hole,

(b) at a distance of not more than 10 metres from the hole, and

(c) on the same side of a public road or highway as the hole.

(2) Where the exploration does not entail the drilling of holes, a permit tag shall be affixed at a point within 10 metres of the centre source point and on the side of a highway or public road as the centre source point.

(3) A permit tag required to be attached or affixed under this Part shall

(a) be made of metal,

(b) be 6 centimetres long and 3 centimetres wide or approximately that size, and

(c) have impressed or engraved on it the permit number of the permittee for the exploration program in letters at least 0.5 centimetres high.

35. Exploration Field Operations - Section 35

Where a misfire occurs in a shot hole, an attempt shall be made to detonate the unexploded charge by the firing of a further charge.

36. Exploration Field Operations - Section 36

The permittee who operates or authorizes the operation of equipment to drill a hole shall abandon the hole

(a) in the case of a shot hole, immediately after detonation of a charge in the hole, and

(b) in the case of a test hole, within 10 days after the drilling of the hole is completed,

in accordance with instructions on hole abandonment issued from time to time by the Minister.

37. Exploration Field Operations - Section 37

The plug of an abandoned hole that is disturbed shall be restored to its previous condition by the person responsible for the disturbance.

38. Exploration Field Operations - Section 38

Where the ground surrounding a hole or excavation subsides, the licensee for the exploration program or the permittee for the exploration program shall

(a) if he is aware of the subsidence, promptly take such action as is necessary

  (i) to fill in the area of the subsidence so that the ground level is the same as it was before the hole was drilled or the excavation made, and

  (ii) to prevent any further subsidence,

and

(b) if he is not aware of the subsidence and the subsidence is reported to the Minister, promptly take the action prescribed by an inspector

(i) to fill in the area of the subsidence so that the ground level is the same as it was before the hole was drilled or the excavation made, and

(ii) to prevent any further subsidence.

39. **PART 5 – Use of Public Lands - Section 39**

A licensee to whom an exploration approval has been issued or any person authorized by the licensee to conduct exploration on his behalf has the right to use the public lands designated in the exploration approval in accordance with the terms and conditions of the approval.

40. **Use of Public Lands - Section 40**

No person shall, in the conduct of exploration, make or clear a cut line on public lands

(a) to a width of more than 8 metres unless consent in writing has been obtained from the Minister of Forestry, Lands and Wildlife,

(b) repealed AR 30/87 s8,

(c) closer than one metre to the location of a survey monument, or

(d) if it is possible to use an existing cut line in the vicinity of the proposed cut line to acquire data or to gain access to the area to be explored.

41. **PART 6 – Use of Forest Land - Section 41**

(1) A permittee or a crew operating exploration equipment with his authorization shall, prior to commencing exploration on lands subject to a forest management agreement or forest management lease,

(a) notify the holder of the agreement or lease of his intention to conduct exploration on the lands subject to the agreement or lease, and

(b) furnish the holder of the agreement or lease with a copy of the approved preliminary plan.

(2) Where an approved exploration program involves the use of the land that is subject to a forest management agreement or forest management lease, the licensee shall furnish to the holder of the agreement or lease a copy of the final plan for the program before or as soon as possible after the final plan is filed under Section 19(1)(a) with the Minister.

42. **Use of Forest Land - Section 42**

Merchantable coniferous trees cut in the course of exploration located on public lands under the administration of the Minister in that part of the Green Area lying south of an imaginary line described in Appendix "A" of Part II of The Forest and Prairie Protection Regulations shall be decked and salvaged in accordance with The Timber Management Regulations under the Forests Act.

43. **PART 7 – Highways and Public Roads - Section 43**

This Part does not apply to licence of occupation roads or right of entry roads.

44. **Highways and Public Roads - Section 44**

Where the shoulder or ditch of a highway or public road is damaged or rutted by exploration equipment, the person operating the equipment or the permittee under whose authorization the equipment was operated shall remove the ruts and repair the damage.

45. Highways and Public Roads - Section 45

(1) Where a public road in a municipal district, county or special area or in an improvement district in the White Area or Yellow Area could be damaged by the use of exploration equipment on it, the permittee under whose authority equipment is to operate on the public road shall ensure that the equipment does not operate until the permittee has delivered to the council for the municipal district or county, the Special Areas Board or the district highway engineer, as the case may be, a written undertaking to be responsible for and to repair all damage caused by the operation of the equipment on the public road.

(2) A written undertaking may be delivered under **subsection** (1) by leaving it at the office of the municipal secretary of the municipal district or county, the office of the secretary of the Special Areas Board or the office of the district highway engineer, as the case may be.

46. Highways and Public Roads - Section 46

(1) Where a permittee or a person operating exploration equipment under his authorization causes any damage within the right of way of a highway or public road, an inspector may direct the permittee to do such acts as are necessary to repair the damage.

(2) Where a permittee or a person operating exploration equipment under his authorization fails to comply with Sections 44 or 45(1), an inspector may direct the permittee to do such acts as are necessary to remedy the non-compliance.

(3) Where an inspector gives a direction pursuant to **subsection** (1) or (2), he shall forward a copy of the direction to the Minister at the address specified by him.

(4) Where a permittee fails to obey a direction given by an inspector under **subsection** (1) or (2), the Misnister of Transportation may do such acts as are necessary to remedy the non-compliance by the permittee or to repair the damage caused, and may recover the cost of doing those acts from the deposit or security given by the permittee under this regulation.

47. Highways and Public Roads - Section 47

(1) In this Section,

- (a) "closed roadway" means
  - (i) a road or road allowance in a municipal district or county that is closed pursuant to The Municipal Government Act or The Public Highways Development Act other than a leased roadway,
  - (ii) a road, trail or bridge in a special area closed by order of the Minister of Municipal Affairs under The Special Areas Act, or
  - (iii) a road or road allowance in an improvement district closed by the Minister of Transportation pursuant to Section 47 of the Public Highways Development Act other than a leased roadway;
- (b) "leased roadway" means
  - (i) a road or a road allowance in a municipal district or county that is closed pursuant to The Municipal Government Act or The Public Highways Development Act and leased by the council for the municipal district or county, or
  - (ii) a road or a road allowance in an improvement district closed by the Minister of Transportation pursuant to Section 47 of the Public Highways Development Act and leased pursuant to regulations made under Section 54(d) of that Act;
- (c) "tenant" means a person who holds a lease to a leased roadway.

(2) A permittee or person operating exploration equipment under the authority of his permit who intends to operate exploration equipment on a leased roadway shall first attempt to obtain the right to enter on the leased roadway by negotiating in good faith the right to enter with the tenant.

(3) If a right to enter cannot be reasonably obtained in accordance with subSection (2), the permittee or person operating exploration equipment under the authority of the permittee's permit may, by giving 48 hours notice in writing to the tenant, enter on the leased roadway for the purpose of operating exploration equipment.

(4) A permittee or person operating exploration equipment under the authority of his permit who intends to operate exploration equipment on a closed roadway shall first attempt to obtain, by negotiation in good faith, consent to enter on the closed roadway from

(a) the municipal district or county, if the closed roadway is located in a municipal district or county,

(b) the Special Areas Broard, if the closed roadway is located in a special area, or

(c) a district highway engineer, if the closed roadway is located in an improvement district.

(5) If consent to enter cannot be reasonably obtained in accordance with subSection (4), the permittee or person operating exploration equipment under the authority of the permittee's permit may enter on the closed roadway for the purpose of operating exploration equipment, by giving 48 hours notice in writing,

(a) to the council for the municipal district or county, if entry relates to a closed roadway in a municipal district or county,

(b) to the Special Areas Board, if entry relates to a closed roadway in a special area, or

(c) to a district highway engineer, if entry relates to a closed roadway in an improvement district.

(6) A notice given under **subsection** (3) or (5) shall

(a) indicate the point or points at which the person operating the exploration equipment will enter on the leased roadway or closed roadway,

(b) indicate the anticipated date of entry on, and the expected date of departure from, the leased roadway or closed roadway by the person operating the exploration equipment, and

(c) contain an undertaking by the holder of the permit under the authority of which exploration equipment will be operated on the leased roadway or closed roadway that he will be liable for any damage resulting from the operation of that equipment on the roadway.

(7) This Section does not apply to exploration for a surface material.

48. PART 8 – Metric Conversion Amendments - Section 48

(1) Section 1(1)(x) of this regulation is amended by striking out "500 feet" and substituting "150 metres".

(2) This Section comes into force on the day upon which Section 6 of Schedule A or The Metric Conversion Statutes Amendment Act, 1977 comes into force.

49. Metric Conversion Amendments - Section 49

(1) Section 2(1)(c) of this regulation is amended by striking out "500 feet" and by substituting "150 metres".

(2) This Section comes into force on the day upon which Section 2 of Schedule A of The Metric Conversion Statutes Amendment Act, 1977 comes in force.

50. PART 9 – Repeal

The Geophysical Regulations (Alta. Reg. 26/59), as amended are repealed.

SCHEDULE A
(Section 4)
EXPLORATION RESTRICTED AREAS

(a) EXPLORATION RESTRICTED AREA NO.1

IN TOWNSHIP TWENTY-NINE (29), RANGE TWENTY THREE (23), WEST OF THE FOURTH (4) MERIDIAN:

The North halves of Sections Fourteen(14) and Fifteen(15) and Sections Twenty-two(22) and Twenty-three(23);

AND

All road allowances, highways and public roads lying within or between any of the above descrided lands.

(b) EXPLORATION RESTRICTED AREA NO. 2

IN TOWNSHIP SEVEN (7), RANGE ONE (1), WEST OF THE FIFTH (5) MERIDAN:

The West half of Section Sixteen (16), Section (17), the East halves of Sections Eighteen (18) and Nineteen (19), Section Twenty (20) and the West half of Section Twenty-one (21);

AND

All road allowances, highways and public roads lying within or between any of the above descrided lands.

(c) **EXPLORATION RESTRICTED AREA NO. 3**

IN TOWNSHIP FOURTEEN (14), RANGE TWENTY-SEVEN (27), WEST OF THE FOURTH (4) MERIDIAN:

Sections Eight (8), Nine (9), Sixteen (16) and Seventeen (17);

AND

All road allowances, highways and public roads lying within or between any of the above descrided lands.

(d) EXPLORATION RESTRICTED AREA NO. 4

IN TOWNSHIP THIRTY-FOUR (34), RANGE ONE (1), WEST OF THE FIFTH (5) MERIDIAN:

The East half of Section Twenty-two (22), Section Twenty-three (23), the West half of Section Twenty-four (24), the South West quarter of Section Twenty-six (26) and the South East quarter of Section Twenty-Seven (27);

AND

All road allowances, highways and public roads lying within or between any of the above descrided lands.

(e) EXPLORATION RESTRICTED AREA NO.5

IN TOWNSHIP FORTY-ONE (41), RANGE FOURTEEN (14), WEST OF THE FOURTH (4) MERIDIAN:

Sections Twenty-two (22), Twenty-three (23), Twenty-six (26) and Twenty-seven (27),

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(f) EXPLORATION RESTRICTED AREA NO. 6

IN TOWNSHIP THIRTY-TWO (32), RANGE ONE (1), WEST OF THE FIFTH (5) MERIDIAN:

The North West quarter of Section Nineteen (19) and the West half of Section Thirty (30);

AND

IN TOWNSHIP THIRTY-THREE (33), RANGE ONE (1), WEST OF THE FIFTH (5) MERIDIAN:

The North West quarter of Section Two (2), the North half of Section Three (3), the North East quarter of Section Four (4), the South East quarter of Section Nine (9), the South half of Section Ten (10) and the South West quarter of Section Eleven (11);

AND

IN TOWNSHIP THIRTY-TWO (32), RANGE TWO (2), WEST OF THE FIFTH (5) MERIDIAN:

The North East quarter of Section Twenty-Four (24), the North half and South East quarter of Section Twenty-five (25), the North East quarter of Section Thirty-five (35) and Section Thirty-six (36);

AND

IN TOWNSHIP THIRTY-THREE (33), RANGE TWO (2), WEST OF THE FIFTH (5) MERIDIAN:

Section One (1) and the East half of Section Two (2);

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(g) EXPLORATION RESTRICTED AREA NO. 7

IN TOWNSHIP TWENTY-THREE (23), RANGE NINE (9), WEST OF THE FIFTH (5) MERIDIAN:

The North half of Section Nine (9), the West half of Section Fourteen (14), Sections Fifteen (15) and Sixteen (16), the East half of Section Seventeen (17) and Sections Twenty-one (21) and Twenty-two (22);

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(h) EXPLORATION RESTRICTED AREA NO. 8

IN TOWNSHIP FIFTY-THREE (53), RANGE SEVENTEEN (17), WEST OF THE FIFTH (5) MERIDIAN:

The North West quarter of Section Fourteen (14), the North half of Section Fifteen (15), Sections Twenty-one (21) and Twenty-two (22), the West half of Section Twenty-three (23), the South West quarter of Section Twenty-seven (27), and the South half of Section Twenty-eight (28);

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(i) EXPLORATION RESTRICTED AREA NO. 9

IN TOWNSHIP THIRTEEN (13), RANGE ONE (1), WEST OF THE FIFTH (5) MERIDIAN:

The East half of Section Twenty-one (21), Section Twenty-two (22), the North West quarter of Section Twenty-three (23), the South half of Section Twenty-seven (27) and the South East quarter of Section Twenty-eight (28);

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(j) EXPLORATION RESTRICTED AREA NO. 10

IN TOWNSHIP THIRTY-ONE (31), RANGE ONE (1), WEST OF THE FIFTH (5) MERIDIAN:

The North half of Section Seven (7) and Sections Eighteen (18) and (19):

AND

IN TOWNSHIP THIRTY-ONE (31), RANGE TWO (2), WEST OF THE FIFTH (5) MERIDIAN:

The North East quarter of Section Eleven (11), the North half of Section Twelve (12), Section Thirteen (13), The East halves of Sections Fourteen (14) and Twenty-three (23) and Section Twenty-four (24):

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(k) EXPLORATION RESTRICTED AREA NO. 11

IN TOWNSHIP FIFTEEN (15), RANGE TWENTY-NINE (29), WEST OF THE FOURTH (4) MERIDIAN:

The North East quarter of Section Thirty-three (33), the North half of Section Thirty-four (34) and the North West quarter of Section Thirty-five (35):

AND

IN TOWNSHIP SIXTEEN (16), RANGE TWENTY-NINE (29), WEST OF THE FOURTH (4) MERIDIAN:

The West half of Section Two (2), Section Three (3), the East halves of Sections Four (4) and Nine (9), Section Ten (10), the North half and South West quarter of Section Eleven (11), Sections Fourteen (14) and Fifteen (15) and the East half of Section Sixteen (16);

AND

All roads allowances, highways and public roads lying within or between any of the above described lands.

(l) EXPLORATION RESTRICTED AREA NO. 12

IN TOWNSHIP THIRTY-SIX (36), RANGE SIX (6), WEST OF THE FIFTH (5) MERIDIAN:

The North halves of Sections Eleven (11) and Twelve (12), Sections Thirteen (13) and Fourteen (14) and the South halves of Sections Twenty-three (23) and Twenty-four (24);

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(m) EXPLORATION RESTRICTED AREA NO. 13

IN TOWNSHIP SIXTY-FIVE (65), RANGE TWENTY-TWO (22), WEST OF THE FOURTH (4) MERIDIAN:

Sections Six (6), Seven (7) and Eighteen (18);

AND

IN TOWNSHIP SIXTY-FIVE (65), RANGE TWENTY-THREE (23), WEST OF THE FOURTH (4) MERIDIAN:

Sections One (1) and Two (2) and Sections Eleven (11) to Fourteen (14) inclusive;

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(n) EXPLORATION RESTRICTED AREA NO. 14

IN TOWNSHIP THIRTY-SEVEN (37), RANGE TWENTY-SIX (26), WEST OF THE FOURTH (4) MERIDIAN:

The North East quarter of Section Nineteen (19), the North West quarter of Section Twenty (20), the South West quarter of Section Twenty-nine (29) and the South East quarter of Section Thirty (30);

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(o) EXPLORATION RESTRICTED AREA NO. 15

IN TOWNSHIP EIGHTY-TWO (82), RANGE TWO (2), WEST OF THE SIXTH (6) MERIDIAN:

Sections Twenty-two (22), Twenty-three(23), Twenty-six(26) and Twenty-seven (27);

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(p) EXPLORATION RESTRICTED AREA NO. 16

IN TOWNSHIP THIRTY-EIGHT (38), RANGE FOUR (4), WEST OF THE FIFTH (5) MERIDIAN:

Sections Thirty-one (31) and Thirty-Two (32);

AND

IN TOWNSHIP THIRTY-NINE (39), RANGE FOUR (4), WEST OF THE FIFTH (5) MERIDIAN:

Sections Five (5) and Six (6);

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(q) EXPLORATION RESTRICTED AREA NO.17

IN TOWNSHIP FORTY-SEVEN (47), RANGE TWENTY-TWO (22), WEST OF THE FIFTH (5) MERIDIAN:

The North half of Section Thirty-one (31) and the North West quarter of Section Thirty-two (32);

AND

IN TOWNSHIP FORTY-EIGHT (48), RANGE TWENTY-TWO (22), WEST OF THE FIFTH (5) MERIDIAN:

Sections Five (5), Six (6) and Seven (7), the South West quarter of Section Eight (8), the West half of Section Eighteen (18) and the South West quarter of Section Nineteen (19);

AND

IN TOWNSHIP FORTY-SEVEN (47), RANGE TWENTY-THREE (23), WEST OF THE FIFTH (5) MERIDIAN:

The North half of Section Twenty-six (26), the North half and South West quarter of Section Twenty-seven (27), Sections Twenty-eight (28), and Twenty-nine (29), the North East quarter of Section Thirty (30) and Sections Thirty-one (31) to Thirty-six (36) inclusive;

AND

IN TOWNSHIP FORTY-EIGHT (48), RANGE TWENTY-THREE (23), WEST OF THE FIFTH (5) MERIDIAN:

Sections One (1) to Five (5) inclusive, the South East quarters of Sections Six (6) and Eight (8), Sections Nine(9) to Fourteen (14) inclusive, the South half and North East quarter of Section Fifteen (15), the South East quarter of Section Twenty-two (22) and Sections Twenty-three (23) and Twenty-four (24).

(r) EXPLORATION RESTRICTED AREA NO.18

IN TOWNSHIP FORTY (40), RANGE THREE (3), WEST OF THE FIFTH (5) MERIDIAN:

The road allowance lying immediately to the South of the adjoining Section Fourteen (14).

(s) EXPLORATION RESTRICTED AREA NO.19

IN TOWNSHIP THIRTY-EIGHT (38), RANGE FOUR (4), WEST OF THE FIFTH (5) MERIDIAN:

The road allowance lying immediately to the North and West of the adjoining Section Eleven (11).

(t) EXPLORATION RESTRICTED AREA NO.20

IN TOWNSHIP THIRTY-SEVEN (37), RANGE TWENTY-THREE (23), WEST OF THE FOURTH (4) MERIDIAN

The West half of Section Five (5), the East halves of Sections Six (6) and Seven (7) and the West half of Section Eight (8);

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(u) EXPLORATION RESTRICTED AREA NO.21

The road allowance immediately adjacent to the North boundaries of Sections 34 and 35, Township 30, Range 5, West of the 5th Meridian.

(v) EXPLORATION RESTRICTED AREA NO.22

IN TOWNSHIP FORTY-THREE (43), RANGE TWENTY-EIGHT (28), WEST OF THE FOURTH (4) MERIDIAN:

Section Fifteen (15), fractional Sections Sixteen (16) and Twenty-one (21) and Section Twenty-two (22);

AND

IN TOWNSHIP FORTY-THREE (43), RANGE ONE (1), WEST OF THE FIFTH (5) MERIDIAN:

Sections Thirteen (13) and Twenty-four (24);

AND

All road allowances, highways, and public roads adjoining or lying within the outer limits of the above described lands.

(w) EXPLORATION RESTRICTED AREA NO.23

IN TOWNSHIP THIRTY-SEVEN (37), RANGE EIGHT (8), WEST OF THE FIFTH (5) MERIDIAN:

The North East quarter of Section Thirty-four (34) and the North half of Section Thirty-five (35);

AND

IN TOWNSHIP THIRTY-EIGHT (38), RANGE EIGHT (8), WEST OF THE FIFTH (5) MERIDIAN:

The South West quarter of Section Two (2) and the South East quarter of Section Three (3);

AND

All road allowances, highways, and public roads adjoining or lying within the outer limits of the above described lands.

(x) EXPLORATION RESTRICTED AREA NO.24

IN TOWNSHIP THIRTY-TWO (32), RANGE TWELVE (12), WEST OF THE FOURTH (4) MERIDIAN:

The North East quarter of Section Twenty-two (22), the North West quarter of Section Twenty-three (23), the South West quarter of Section Twenty-six (26) and the South East quarter of Section Twenty-seven (27);

AND

All road allowances, highways, and public roads lying within or between any of the above described lands.

(y) EXPLORATION RESTRICTED AREA NO.25

IN TOWNSHIP THIRTY-ONE(31), RANGE EIGHT(8), WEST OF THE FIFTH(5) MERIDIAN:

The North half and South West quarter of Section Eighteen (18), Section Nineteen (19) and the South West quarter of Section Thirty (30);

AND

IN TOWNSHIP THIRTY-ONE(31), RANGE NINE(9), WEST OF THE FIFTH(5) MERIDIAN:

The North half and South East quarter of Section Thirteen (13), Section Twenty-four(24) and the South half of Section Twenty-five(25);

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

(z) EXPLORATION RESTRICTED AREA NO.26

IN TOWNSHIP TWENTY-ONE(21), RANGE TWO(2), WEST OF THE FIFTH(5) MERIDIAN:

That portion of the South half of Section Twenty-six(26) taken for a roadway as shown on a plan of survey, on file in the Land Titles Office for the South Alberta Land Registration District, as 4393 EZ.

(aa) EXPLORATION RESTRICTED AREA NO.34

IN TOWNSHIP THIRTY-SIX(36), RANGE FIVE(5), WEST OF THE FIFTH(5) MERIDIAN:

Sections Five(5), and Six(6);

AND

IN TOWNSHIP THIRTY-FIVE(35), RANGE FIVE(5), WEST OF THE FIFTH MERIDIAN:

The North East Quarter of Section Ninteen(19), The North half of Section Twenty(20), Sections Twenty-nine(29), Thirty(30),Thirty-one(31), and Thirty-two(32);

AND

IN TOWNSHIP THIRTY-FIVE(35), RANGE SIX(6), WEST OF THE FIFTH(5) MERIDIAN:

Section Twenty-five(25), and The South East Quarter of Section Thirty-Six(36);

AND

All roads allowances, highways and public roads lying within or between any of the above described lands.

(ab) EXPLORATION RESTRICTED AREA NO.35

ALL TOWNSHIP EIGHTY(80), RANGE NINE(9), WEST OF THE FIFTH (5) MERIDIAN:

To the boundary of the Utikuma Lake Indian Reserve No. 155A and the shore line of Utikuma Lake;

AND

ALL TOWNSHIP EIGHTY-ONE(81), RANGE NINE(9), WEST OF THE FIFTH(5) MERIDIAN;

AND

ALL TOWNSHIP EIGHTY-ONE(81), RANGE TEN(10), WEST OF THE FIFTH(5) MERIDIAN;

AND

ALL TOWNSHIP EIGHTY-TWO(82), RANGE NINE(9), WEST OF THE FIFTH(5) MERIDIAN;

AND

ALL TOWNSHIP EIGHTY-TWO(82), RANGE TEN(10), WEST OF THE FIFTH(5) MERIDIAN;

AND

All road allowances, highways and public roads lying within or between any of the above described lands.

SCHEDULE B
(Section 24)

	Non-explosive	Explosive		Test Hole
	Distance (metres)	Charge Weight (kilograms)	Distance (metres)	Distance (metres)
Residence, barn, cemetery and a building or structure with a concrete base	50	all	180	100
Water Well	100(Vibroseis) 50(other than) (Vibroseis)	all	180	180
Driveway, gateway or buried water pipeline	5	all	10	10
Survey monument or buried telephone or telecommunication line	1	all	1	1
Oil or gas pipeline (measure from centre line of the pipeline) and an oil or gas well	15	≤2	32	32
		>2 ≤4	45	
		>4 ≤6	55	
		>6 ≤8	64	
		>8 ≤10	72	
		>10≤20	101	
		>20≤40	143	
		>40	180	

Note:
In this Schedule, "oil or gas pipeline" means a pipeline for the transmission of oil or gas and having a maximum operating pressure of 690 kilopascals or greater.

A.1.19 THE OIL AND GAS CONSERVATION ACT

This Act does not contain any specific environmental requirements however, it does state that the Board may refer any operations to the Minister of the Environment for approval and that any conditions specified by the Minister shall be imposed by the Board.

A. Oil and Gas Conservation Regulations – Alberta Regulation 151/71 and Amendments

1. Licensing of Wells – Water Pollution Control – Section 2.120

(1) No person shall

(a) drill a well or cause or permit a well to be drilled, or

(b) construct a pit for containing mud, oil, water and other fluids associated with the well or cause or permit such a pit to be constructed,

closer than 100 metres, or such greater distance as the Board may direct, to the normal high water mark of a body of water or permanent stream unless he has obtained written approval from the Board of his plans to prevent pollution of the water.

(2) The plans referred to in **subsection** (1) shall

(a) indicate the elevations of the normal high water mark and surrounding land and

(b) set forth measures to meet the particular circumstances that may be encountered including

(i) the construction and maintenance of dikes, reservoirs and other installations, as may be required, and

(ii) the final disposal of mud, oil, water and other fluid associated with the well or drilling operation.

2. Drilling, Completing & Servicing – Control of Fluids Encountered – Section 6.050

The licensee of a well and the operator of equipment at a well shall, at all times during which the well is being drilled, tested, completed or reconditioned,

(a) conduct operations, and

(b) maintain casing and control equipment,

so that any oil, gas or water encountered shall be effectively controlled.

3. Drilling, Completing & Servicing – Casing and Equipment at a Well – Section 6.080

(4) Where the required surface casing setting depth is less than

(a) 180 metres, or

(b) 25 metres below any aquifer which is a source of potable water being taken within 3 kilometres of the well,

the casing string next to the surface casing shall be cemented to surface from a depth not less than the depth set out in clause (a) or (b) hereof.

4. Drilling, Completing & Servicing – Casing & Equipment at a Well – Section 6.100

(1) The licensee of a well completed to produce oil or gas or to inject any fluid shall leave the annulus between the second casing string and the surface casing open to the atmosphere in the manner described in **subsection** (2).

(2) The licensee shall vent the annulus by a line which, subject to such other specifications as the Board may prescribe in a particular case, shall

(a) have a minimum diameter of 50 millimetres,

(b) extend at least 60 centrimetres above ground level,

(c) terminate so that any flow is directed either in a downward direction or parallel to the ground, and

(d) be equipped with a valve where the hydrogen sulphide concentration in a representative sample of gas from the well is found to exceed 50 moles per kilomole.

(3) The working pressure rating in kilopascals of all parts of the surface casing vent shall be at least 25 times the numerical equivalent of the surface casing depth in metres required.

(4) The Board may exempt a well from the requirements of this Section if the well pressures are such that annulus vents are not necessary.

5. **Production Operations – Air Pollution Control – Section 7.040**

(1) No person shall burn, and no licensee of a well or operator of a plant or battery shall cause or permit to be burned, any oil, gas, oily waste or other material produced or used at a well or in the operation of a scheme, except under conditions of controlled combustion where there is no significant or visible emission of smoke, unless he has obtained written approval from the Board or its authorized representative.

(2) Notwithstanding subSection (1), burning of well or plant effluent is permissible under emergency conditions and due to equipment failure, but such burning shall immediately be reported to the Board.

6. **Production Operations – Air Pollution Control – Section 7.050**

(1) This Section applies to a well at which the hydrogen sulphide concentration in a representative sample of gas from the well is found to exceed 50 moles per kilomole, or such higher or lower ratio as the Board may, by order, stipulate with respect to any well or group of wells in a battery, pool or area, having regard to pressures, nature of production, remoteness of the area and other circumstances.

(7) Where a well that is not on pump and

(a) is located within 800 metres of an occupied dwelling or within 8 kilometres of the limits of a city, town or village and has, in the opinion of the Board the potential to produce more than 140 thousand cubic metres of gas per day, or

(b) the Board so directs,

the licensee shall install in the tubing of the well, at a minimum depth of 30 metres below the surface, or such other depth as the Board may prescribe, a valve that may be controlled from the surface and which will close automatically in the event of an uncontrolled flow of oil or gas or a failure in the system which operates the valve.

(9) The Board may, upon application, exempt from any provision of this Section a well or group of wells in a battery, pool or area where, in the opinion of the Board, the pressures, nature of production, remoteness of the area or other circumstances warrant the exemption.

7. **Production Operations – Air Pollution Control – Section 7.060**

(1) This Section applies to any well which produces gas containing more than 10 moles per kilomole hydrogen sulphide, or such higher or lower ratio as the Board may by order stipulate with respect to any well, pool or area, having regard to pressures, nature of production, remoteness of the area and other circumstances.

(2) Where a flare line is installed at a gas well for burning gas produced during normal depressurizing operations or other routine flaring, the licensee shall provide a flare stack constructed in accordance with the specifications for a flare line set out in subSection(4).

(3) Where a pressure relief valve, rupture disk or burst plate is installed on a separator, dehydrator, or other pressure vessel which receives production from a gas well, the valve, rupture disk or burst plate fitting shall be connected to the flare stack required by **subsection** (2).

(4) Where gas is produced from any well to the atmosphere for a period exceeding 10 minutes during a drill stem test, the licensee shall burn the gas through a flare line which shall

(a) terminate with a vertical riser of at least 12 metres or such greater height as the Board considers necessary in a particular case,

(b) be provided with a suitable guard to prevent the wind from extinguishing the flame, and

(c) if the gas flow may be intermittent, be provided with a pilot or ignition device to ensure continuous ignition of any vented gas.

(5) Where gas is produced from a well during any test, during any period of cleaning out the well or during well servicing operations, the licensee shall obtain written approval of the Board of the method, stack height and equipment to be used to flare the gas.

(6) An application, submitted under **subsection** (5) shall be in accordance with Section 15.240

(7) Where liquids are produced from a well during any test, during any period of cleaning out the well or during well servicing operations, the liquids shall be separated and piped to a storage tank and all gas shall be discharged to an approved flare stack.

(8) Unless the licensee of a well equips and operates the well so that the maximum operating flow line gauge pressure cannot exceed 200 pounds per square inch gauge, he shall install on the wellhead a valve which closes automatically in the event of an uncontrolled flow of oil or gas.

(9) The licensee of the well shall, when requested to do so by the Board, file with the Board an outline of emergency procedures to ensure public safety which will be followed by the licensee in the event of an uncontrolled emission of oil or gas.

(10) The Board may by order and upon application exempt a well, pool or field from any provision of this Section where, in the opinion of the Board, the pressure, nature of production, remoteness of area or other circumstances warrant the exemption.

8. **Production Operations – Air Pollution Control – Section 7.070**

(1) This Section applies to a battery at which the hydrogen sulphide concentration of a representative sample of the gas which is or may be emitted at the battery exceeds 10 moles per kilomole or such higher or lower ratio as the Board may by order stipulate having regard to the nature of production, remoteness of the area and other circumstances.

(5) The operator of the battery shall erect suitable signs at the entrance to the battery warning of the presence of poisonous gas.

(7) The licensee of a well or the operator of a battery shall not discharge or permit to be discharged to the atmosphere stock tank vapours or any other gas produced from the well, other than vapours from the tank referred to in Section 8.031, unless they are burned so that essentially all sulphur compounds are converted to sulphur dioxide, but the Board on written application may approve another method of disposal.

(8) Gas, burned or disposed of by a method approved under **subsection** (7), shall be so burned or disposed of as to insure that the average concentration of hydrogen sulphide and sulphur dioxide in the ambient air does not exceed the maximum permissible concentrations set out in the Clean Air (Maximum Levels) Regulations under the Clean Air Act or any other standards the Board or the Department of the Environment may specify.

(9) Gas which is required to be burned by **subsection** (7) shall be discharged from a flare line which is in accordance with the specifications outlined in Section 7.060, **subsection** (4).

(10) The Board may upon application exempt a battery from any provision of this Section where in the opinion of the Board the nature of production, remoteness of the area or other circumstances warrant the exemption.

9. **Prevention of Losses, Injuries, Damages & Fires – Storage – Section 8.010**

No oil shall be stored in pits.

10. **Prevention of Losses, Injuries, Damages & Fires – Storage – Section 8.020**

(1) No crude bitumen or hydrocarbon derived therefrom shall be stored in a pit without the written approval of the Board.

(2) Where pit storage is approved under **subsection** (1), the operator shall not commence or continue to use pit storage until the Board or its authorized representative has approved the pit and any necessary fencing or protective installation.

11. **Prevention of Losses, Injuries, Damages & Fires – Storage – Section 8.030**

(1) Each tank or group of tanks containing oil or any fluid other than fresh water at a battery or processing plant shall be surrounded by a dike or firewall of a net capacity greater than that of the largest tank within the dike or firewall, or such greater capacity as the Board may in any case require, and the dike or firewall shall be maintained in good condition and the dike or firewall and the area encompassed by it kept free from grass, weeds or other extraneous combustible material, but the Board may suspend any requirement of this subSection in a particular case.

(2) Each oil tank or battery of tanks at a well, production battery or processing plant shall be located so that the distance from the outer perimeter of the dike to any surface improvement other than a public roadway is not less than 60 metres

(3) Notwithstanding subsection (2), the Board, where in its opinion special circumstances exist, may permit the location of tanks closer to any surface improvement than the distance therein prescribed.

12. **Prevention of Losses, Injuries, Damages & Fires – Storage – Section 8.031**

Where a pressure relief valve, rupture disk or burst plate is installed on a separator, treater or other pressure vessel which receives production from an oil well, the licensee shall connect the valve, rupture disk or burst plate fitting by suitable piping to an open tank, but the Board, upon application, may allow a licensee to use a system of automatic controls or other method of avoiding oil spills if it is satisfied that the degree of protection provided is equivalent to or better than the venting of relief devices to an open tank.

13. **Water Disposal – Section 8.040**

(1) The licensee of a well or the operator of a battery or processing plant shall dispose of all water produced from a well in a manner satisfactory to the Board.

(2) Not more than one pit shall be used for the disposal or storage of water produced to a battery or a processing plant or produced from a well not connected to a battery.

(3) An earthen pit used for the storage or disposal of water produced from a well or to a battery or a processing plant shall

(a) be constructed of clay or other suitable impermeable material,

(b) have a surface area of not more than 300 square metres,

(c) be excavated to a depth to which it may be filled with water,

(d) have walls rising at least 60 centimetres above ground level, and

(e) be so located that it will not collect natural run-off water.

(4) Not more than 15 cubic metres of water produced from a well or to a battery or processing plant may be disposed of or stored in an earthen pit in any month but the Board may prescribe a greater or lesser volume, or may prohibit disposal or storage of water in a pit in any area, having regard to the salinity of the water, the nature of the soil and other circumstances.

(5) All water produced to a battery or produced at a well not connected to a battery or produced at a processing plant in excess of the limit specified in or pursuant to subSection (4) shall be disposed of in accordance with a scheme approved by the Board pursuant to Section 38 of the Act.

14. **Control of Oil and Salt Water Spills – Section 8.050**

(1) When oil or salt water is spilled from a break or leak in a wellhead, tank, separator, treater or process vessel, the licensee of the well or operator of the battery, plant, oil sands scheme or other facility from which the spill occurred shall take immediate steps to contain and clean up the oil or salt water that is spilled and shall ensure that the contaminated product is processed in the operator's facilities or is sent to an approved waste processing and disposal facility unless othewise approved by the Board.

(2) Where a spill of oil or salt water occurs from a facility described in subclause (1) and

(a) the oil or salt water is not confined to the site of the facility from which the spill occurred, or

(b) the oil or salt water spilled is in excess of 2 cubic metres

the licensee or operator shall immediately report the size and location of the spill to the Board by the quickest effective means.

(3) When so directed by the Board, a report made pursuant to subclause (2) shall, within two weeks of the date of the spill, be confirmed in a written report to the Board and be supplemented with at least the following additional information:

(a) the time the spill occurred,

(b) a description of the circumstances leading to the spill,

(c) a discussion of the spill containment and recovery procedures,

(d) a discussion of steps to be taken to prevent similar future spills, and

(e) an outline of the proposed spill site rehabilitation program.

15. **Control of Oil and Salt Water Spills – Section 8.050**

Where oil or salt water is spilled while being transported, otherwise than by pipeline from a well, battery, gas plant, pipeline or other facility over which the Board has jurisdiction, to any other like facility, the licensee of a well or pipeline or operator of a battery, gas plant or other facility and the owner of the transportation facility shall immediately

(a) report the spill to the Board and to the Department of Environment,

(b) take steps to contain and clean up the oil or salt water that is spilled, and

(c) ensure that the contaminated oil and salt water is sent to an approved waste processing and disposal facility unless otherwise approved by the Board.

16. **Control of Oil and Salt Water Spills – Section 8.060**

Where a well or battery is located closer than 100 metres to the normal high water mark of a body of water or permanent stream or is in a location such that in the opinion of the Board an oil spill or leak may reach the water, the licensee or operator shall

(a) where a well is not on pump, install on the well head a valve which closes automatically to shut off an uncontrolled flow of oil from the well in the event of a failure of the well head, surface facilities, or gathering line,

(b) at the direction of the Board, install in the well a packer and a subsurface valve to shut off automatically an uncontrolled flow of oil from the well in the event of a failure of the well head or production casing,

(c) construct pits, dikes, trenches or other structures or installations to contain the oil, and

(d) submit at the request of the Board, a plan to limit the spread of and to recover oil from the surface of the water in the event of a leak or spill, such plan to include details of procedures, materials and equipment proposed to be used.

17. Control of Oil and Water Spills – Section 8.070

Where in the opinion of the Board, the location or condition of a well or battery is such that it may become a source of serious water pollution, the Board may require that the well or battery be abandoned.

18. **Care of Well Sites and Battery Sites – Section 8.150**

(1) In this Section, "waste material" means water, rubbish, debris, drilling fluids, oil oily waste, sand tailings or other products from a well, oil sands operation, tank, pipeline or other production installation.

(2) The licensee of a well or operator of a battery or scheme shall

(a) ensure that waste material is contained at all times,

(b) dispose of, or cause to be disposed of, all waste material in such a manner that no air, soil, surface water or underground source of potable water is or could be polluted, or

(c) ensure that waste material does not create or constitute a safety hazard or nuisance.

(3) An earthen pit at a well site used to store liquid wastes from a drilling or servicing operation shall

(a) be excavated to a depth to which it may be filled with liquid, and

(b) be so located and constructed that it will not collect natural run-off water.

(4) Where the surface topography is such that a satisfactory storage pit of sufficient capacity cannot be constructed, the licensee of a well or operator of a battery shall contain all liquid waste in tanks and shall remove such liquid waste without undue delay to an area approved under **subsection** (2) clause (b).

(5) Upon the completion, suspension or abandonment of a well or the abandonment of a battery, the licensee of the well or operator of the battery shall

(a) dispose of all liquid waste,

(b) clear the area of debris,

(c) fill all excavations made in connection with the well or battery, and

(d) advise the appropriate Board Area Office when the operation is completed.

19. Care of Well Sites and Battery Sites – Section 8.160

The operator of a waste processing and disposal facility shall

(a) ensure that waste material is contained at all times,

(b) dispose of, or cause to be disposed of, all waste material in such a manner that no soil, surface water or underground source of potable water is or could be polluted,

(c) ensure that waste material does not create or constitute a safety hazard or nuisance, and

(d) maintain the site in a clean condition.

20. Fencing – Section 8.170

(1) At each battery at which the hydrogen sulphide concentration in a representative sample of the gas from any well producing to the battery is found to exceed 10 moles per kilomole, or such higher or lower ratio as the Board may by order stipulate in a particular case, the licensee shall construct and maintain an adequate fence around the battery, but the Board, on application, may exempt a battery from the provisions of this Section where it is of the opinion that the pressures, nature of production, remoteness of area or other circumstances warrant the exemption.

(2) For the purpose of **subsection** (1) a fence shall be considered adequate if

(a) where a battery is within 800 metres of an occupied dwelling, rural school, picnic grounds or the like, it is at least 2 metres high, small mesh industrial type, completely enclosing the battery, and equipped with a gate that is locked when the battery is unattended, or

(b) where a battery is located elsewhere, it is a cattle type fence with a minimum of four strand barbed wire and either a gate or cattle guard.

21. Fencing – Section 8.180

(1) The licensee of a well equipped with a pumping unit and located within 800 metres of a hamlet or larger residential centre shall enclose the well and pumping unit with a fence suitable for the prevention of tampering with well head equipment.

(2) A fence required by **subsection** (1) shall be

(a) of steel mesh, with the mesh not greater than 130 square centimetres,

(b) not less than 2 metres high,

(c) placed around the entire pumping unit, well head and cellar, and

(d) equipped with a gate that is locked when the well is unattended.

22. Processing Plants – Section 9.010

In this Part, except where the context otherwise requires, "sulphur" means all sulphur in whatever compound or physical form it may exist. (AR 151/71; AR 71/74)

23. Processing Plants – Section 9.020

(1) An application under Section 38, **subsection** (1) clause (b) of the Act; Section 4, **subsection** (1) clause (a) or Section 4.1, **subsection** (1), of the Clean Air Act; or Section 4, **subsection** (1), clause (e) or Section 4.1 clause (1) of the Clean Water Act, for approval of a new scheme or a major modification to an existing scheme for the processing of gas shall be filed with the Board and shall conform with the requirements of Section 15.050.

(2) An application referred to in **subsection** (1) may be made in two parts, the first part concerning the location, conservation levels and pollution control features of the proposed scheme and being for approval to construct the proposed scheme, the second part concerning the other details of the scheme and being for approval to operate the proposed scheme.

(3) Upon the filing of a completed application, or where an application is to be made in two parts, upon the filing of a completed first part of an application for approval, or a major amendment of approval, of a scheme for the processing of gas and where it appears to the Board that its decision on the application

(a) may directly and adversely affect the rights of any person, the Board shall hold a public hearing or publish notice of the application, or

(b) would not directly and adversely affect the rights of any person, the Board may grant the application without notice or hearing.

(4) Where an application has been made in two parts, and where the Board, the Director of Standards and Approvals of the Department of the Environment and the Minister of the Environment have approved the location, conservation levels and pollution control features of the proposed scheme, the Board may consider the second part of the application without hearing or further notice of the application.

24. Processing Plants – Section 9.030

(1) No person shall commence construction related to a new scheme or a major modification to an existing scheme for the processing of gas until the Board and the Minister of the Environment have approved the location, conservation levels and pollution control features of the scheme, and the Director of Standards and Approvals of the Department of the Environment has issued a permit to construct the necessary facilities pursuant to the Clean Air Act and the Clean Water Act.

(2) No person shall commence processing operations related to a new scheme or a major modification to an existing scheme for the processing of gas until the Board and the Minister of the Environment have approved the scheme and the Director of the Division of Standards and Approvals of the Department of the Environment has issued a licence to operate the scheme pursuant to the Clean Air Act and the Clean Water Act.

25. Processing Plants – Section 9.040

The operator of a processing plant shall conduct operations in such a manner as to maintain the average maximum concentration of any air contaminant in the ambient air within the maximum permissible concentrations set out in the Clean Air (Maximum Levels) Regulations under the Clean Air Act or any other standards the Board or the Department of the Environment may specify.

26. Processing Plants – Section 9.050

(5) The operator of a processing plant shall not discharge or permit to be discharged from the plant to the atmosphere any gas containing hydrogen sulphide unless it is burned so that essentially all of the sulphur is converted to sulphur dioxide, but the Board on written application may approve another method of disposal.

(6) The operator of a processing plant shall conduct operations in such a manner as to

(a) control the emission of sulphur dust to the satisfaction of the Board and the Department of the Environment,

(b) control the emission of unburned hydrocarbon vapours to the satisfaction of the Board and the Department of the Environment,

(c) control the emission of odourous materials to the satisfaction of the Board and the Department of the Environment,

(d) control the emission of smoke to the satisfaction of the Board and the Department of the Environment, and

(e) control noise to the satisfaction of the Board and the Department of the Environment.

(7) The disposal from a processing plant of water produced in association with gas or oil, shall be in accordance with Section 8.040.

27. **Processing Plants – Section 9.060**

The operator of a processing plant in which gas containing more than 10 moles per kilomole hydrogen sulphide, or such higher or lower ratio as the Board may by order stipulate, is being processed, shall, prior to the initial processing of gas, file with the Board and the Department of the Environment an outline of emergency procedures to ensure public safety, that will be followed in the event of an uncontrolled release of contaminants to the air, water or land from the processing plant.

28. **Gas Processing and Underground Storage – Section 15.050**

(1) An application under Section 9.020 for approval of a new scheme or an amendment to an existing scheme for the processing of gas shall include, when applicable, the information set out in subsections (3) and (4).

(2) The application shall be structured in distinctly separate Sections which contain information respecting,

(a) general matters,

(b) the plant location,

(c) conservation levels,

(d) air pollution, and

(e) water pollution.

(3) Where an application is made in two parts, as provided for in Section 9.020, the first part of the application shall include, when applicable,

(a) a map or maps covering the area within a 16 kilometre radius of the plant showing

(i) the plant location,

(ii) the topography of the area,

(iii) the location of all lakes, streams and other surface bodies of water in the area,

(iv) the location, where practical, of all occupied buildings within an 8 kilometre radius of the plant,

(v) the location of other gas processing or industrial plants in the area, and

(vi) the general land use of the area

(b) a general discussion of the overall process scheme proposed,

(c) tabulations of

(i) the analysis of the raw gas from each pool from which the gas would be gathered and a composite analysis of the feed gas to the processing plant under normal operating conditions and anticipated conditions of maximum hydrogen sulphide content,

(ii) an overall plant material balance based on normal operating conditions and anticipated conditions of maximum hydrogen sulphide inlet rate,

(iii) the maximum acid gas rate to the sulphur plant and the hydrogen sulphide content of the acid gas, under the maximum conditions referred to in subclause (i), and

(iv) a forecast of the raw gas to be processed and the plant products to be recovered by years over the life of the scheme,

(d) a discussion of the reasons for the choice of the plant location having regard to the control of pollution,

(e) evidence of any communications with the residents in the vicinity of the proposed plant to advise them of the company's plans in the area and the possible impact these plans could have on the local residents, where such communications have taken place,

(f) technical evidence and cost data in support of the proposed recovery level of sulphur and hydrocarbons including an economic evaluation of the feasibility of conserving any sulphur or hydrocarbons that would not be recovered,

(g) stack design data including

(i) key dimensions,

(ii) the location of the incinerator and flare stacks within the plant area,

(iii) the elevation above sea level of the base of the incinerator and flare stacks,

(iv) minimum incinerator stack gas exit temperature,

(v) stack gas composition for the normal and maximum sulphur emission case,

(vi) normal and maximum half-hour average incinerator stack gas sulphur dioxide concentration, and

(vii) normal and maximum half-hour average sulphur emission rate,

(h) evidence, including allocations of dilution gas where applicable, that the main and emergency stacks have been designed to maintain the average maximum concentration of sulphur dioxide within the maximum permissible concentrations set out in the Clean Air (Maximum Levels) Regulations under the Clean Air Act or any other standards the Board or the Department of the Environment may specify for both normal operating conditions and conditions of maximum sulphur emissions,

(i) a general discussion of the method proposed for control of hydrocarbon vapour emissions including emissions from product storage tanks,

(j) a general discussion of the method proposed for control of sulphur dust,

(k) a general discussion of the method proposed for control of smoke,

(l) a general discussion of the method proposed for control of odours,

(m) a general discussion of the method by which and the manner in which the release of any other contaminant to the atmosphere during normal or abnormal plant operations would be controlled,

(n) a general discussion of the method for control of noise,

(o) a general discussion of the monitoring program for hydrogen sulphide, sulphur dioxide and sulphur dust in the surrounding area,

(p) a general discussion of the manner in which water produced in association with gas and oil would be treated and disposed of,

(q) a general discussion of the manner in which process waste water would be contained, treated and disposed of,

(r) a general discussion of the manner in which surface water drainage within the plant process and storage areas would be contained, treated and disposed of,

(s) a general discussion of the manner in which sanitary sewage would be treated and disposed of,

(t) a general discussion of the manner in which the disposal of solid waste material would be conducted to minimize contamination of surface and ground waters,

(u) a general dicussion of the method by which and the manner in which any other contaminant would be released to the surface water or disposed of to an underground formation,

(v) a general discussion of the proposed method of and frequency of monitoring of waste water volume flow rates and contaminant concentrations,

(w) a general discussion of the feasibility of using a single large gas processing plant in the area of the application rather than two or more smaller plants or the feasibility of expanding a nearby existing gas processing plant to handle the additional gas which is to be processed in the proposed plant,

(x) such further information as the Board may require.

(4) Where an application is made in two parts, as provided for in Section 9.020, the second part of the application shall include, when applicable

(a) detailed information as to any changes in the information supplied under **subsection** (3) with, where appropriate, new plans, diagrams and statements,

(b) maps showing

  (i) the lessors and lessees of petroleum and natural gas rights within and adjoining the scheme area,

  (ii) the status of each well within and adjoining the scheme area for each zone in which it is completed, and

  (iii) the gathering facilities including line size, and operating pressures,

(c) a detailed description of the overall process scheme,

(d) figures showing

  (i) a process flow diagram of the proposed facilities,

  (ii) the facilities for measurement of all streams entering and leaving the processing plant or directly affecting the measurement of such streams,

(e) a discussion of product specifications and composition and the facilities to be provided for product storage,

(f) a discussion of the provisions made for marketing or conservation of all plant products,

(g) a scale plan of the plant site showing

  (i) the location of processing, storage and other facilities,

  (ii) sewer lines,

  (iii) the points of discharge of any contaminant from the plant,

  (iv) the location of all air contaminant control equipment,

  (v) the location of all waste water treatment facilities, and

  (vi) the location of all surface drainage water control and treatment facilities,

(h) a plan of the incinerator stack showing

  (i) the size, location and height of sampling ports,

  (ii) the access ladder and sampling platform, and

  (iii) the locations of the exit temperature measuring device and electric power outlets,

(i) a detailed description of the method proposed for control of hydrocarbon vapour emissions including emissions from product storage tanks,

(j) a detailed description of the method proposed for control of sulphur dust,

(k) a detailed description of the method proposed for control of smoke,

(l) a detailed description of the method proposed for the control of odours,

(m) a detailed description of the method by which and the manner in which the release of any other contaminant to the atmosphere during abnormal or normal plant operations would be controlled,

(n) a detailed description of the method proposed for the control of noise,

(o) a detailed description, including maps showing air quality monitoring installations, of the monitoring program for hydrogen sulphide, sulphur dioxide and sulphur dust in the surrounding area,

(p) design details, supported by drawings where necessary, of the facilities to be provided for the containment, treatment and disposal of water produced in association with oil and gas, process waste water, surface drainage water and sanitary sewage including, where applicable,

  (i) for detention lagoons and settling ponds, retention time based on design flow rates, removal efficiency with respect to suspended solids, sulphides, chemical oxygen demand and ammonia nitrogen, and percolation data respecting the permeability of the soil to indicate expected seepage,

  (ii) for evaporation ponds, in addition to the information required by subclause (i), local evaporation and precipitation data,

  (iii) for oil separators, retention time, design maximum flow rates, and oil removal efficiency, and

  (iv) for sour water strippers, design flow rate, operating temperature and pressure, and hydrogen sulphide removal efficiency,

(q) a discussion of the type and the amount of chemicals and processing materials to be used,

(r) a statement of the calculated concentration and emission rate of every contaminant that would be discharged from the plant,

(s) a discussion of the plant start up procedures to be followed having regard to the control of pollution,

(t) an outline of emergency procedures to ensure public safety, that will be followed in the event of an uncontrolled release of contaminants to the air, water or land, as required by Section 9.060, and

(u) such futher information as the Board may require.

(5) Where an application as defined in **subsection** (1) is made for a major modification to an existing scheme the application shall include

(a) a discussion of the exact nature of the modification,

(b) a discussion of the effect of the modification on the existing plant, and

(c) the information required by subsections (3) and (4) where any changes from information previously filed would take place or where the information has not been previously submitted to the Board.

29. Gas Processing and Underground Storage – Section 15.060

An application under Section 38, clause (b) of the Act for approval of a new scheme or a major modification to an existing scheme, for the underground storage of gas shall include, when applicable

(a) maps showing

  (i) the area included in the scheme,

  (ii) the lessors and lessees within and adjoining the scheme area, and

  (iii) the status of each well within and adjoining the area for each zone in which it is completed, and the gas gathering facilities including line size and operation pressures,

(b) a figure showing the facilities for the measurement of all relevant streams within the scheme area,

(c) a tabulation of the analyses of raw gas from each pool from which gas will be gathered or injected,

(d) evidence, including reservoir calculations, illustrating that the storage of gas is consistent with sound conservation practices,

(e) a discussion of the method proposed for the control of pollution which might result from the gathering or injection of gas containing hydrogen sulphide, and

(f) a discussion of the future disposition of the stored gas.

30. **Battery Construction – Section 15.210**

(1) An application under Sections 7.001 and 7.002 for approval of the location, construction and operation of a battery shall include, when applicable

(a) the name, location and co-ordinates at the centre of the battery,

(b) a listing on the Board's Form S-7 of the well names and pool codes for each well producing to the battery,

(c) estimated mimimum, maximum and average oil, gas and water rates for each well,

(d) the specification of the separation equipment including pressure rating, mimimum and maximum flow capacities and operating pressures and temperatures,

(e) a discussion of

(i) the well testing frequency and duration,

(ii) the accuracy capability of the battery, and

(iii) any off lease disposal,

(f) a list of the common flow lines approved under Section 7.020 and the method of testing the wells on each common line,

(g) a schematic flow diagram showing

(i) the location of all separation and storage facilities,

(ii) the location and type of measurement equipment with each measurement point properly identified,

(iii) emergency relief valves, lines, tanks or emergency shut down system,

(iv) location and size of pits, dikes, flare lines and pop tanks, and

(v) the location and capacity of pumps or compressors delivering oil, gas or water to a pipe line,

(h) a sample set of "S" reports for the battery system with each entry explained using the identified measurement points from the schematic flow diagram,

(i) a plan showing the land surface contours, type of vegetation and tree cover, bodies of water and surface improvements within 200 metres of the battery and the size and location of the battery site.

(2) Where gas containing more than 10 moles per kilomole hydrogen sulphide may be emitted, the application shall include, in addition to the requirements of subSection (1),

(a) an average analysis on a condensate-free basis of the gas to be flared,

(b) details regarding collection and disposal of vapours from oil and water storage tanks,

(c) flare stack construction, diameter and height,

(d) a map showing the proposed location of the battery, topography of the area, limits of cities, towns or villages, rural residences, recreation areas and other batteries within a 5 kilometre radius of the proposed battery, and

(e) the maximum amount of time the battery will be unattended.

(3) Where production from more than one pool is received at the battery, the application shall include, in addition to the requirements of **subsection** (1), the computer sheets of the error analysis of the oil and gas measurements made at the battery and comments concerning the various errors that were assigned.

31. **Flaring of Sour Gas – Section 15.240**

An application under Section 7.060 for approval of the method, stack height and equipment used to flare gas containing more than 10 moles per kilomole hydrogen sulphide, shall include

(a) the dimensions of the proposed stack (height and diameter),

(b) a map showing the location of the well, topography of the area, limits of cities, towns or villages, residences and recreation areas within a three-kilometre radius of the well site,

(c) the maximum rate at which the well will be flowed,

(d) the total volume of gas to be flared,

(e) an analysis on a condensate-free basis of the gas from the well in question or if a gas sample from the well is not available, an analysis of the gas from the same pool,

(f) the anticipated rate of liquid production, and

(g) a description of the method of handling the liquid production from the well.

A.1.20 THE OIL SANDS TECHNOLOGY AND RESEARCH AUTHORITY ACT

1. **Purposes of Act - Section 2**

The purposes of this Act are to provide means whereby

(a) research into the technological methods required for

  (i) the efficient and economic recovery and processing of crude bitumen and other oil sands products from oil sands deposits,

  (ii) the efficient and economic recovery of crude oil through the use of enhanced recovery methods, and

  (iii) the efficient and economic processing of crude oil,

may be assisted, encouraged and promoted;

(b) research into the technological methods required to ensure an acceptable quality of the environment during and after those recovery and processing operations may be assisted, encouraged and promoted;

(c) the compilation, assessment and dissemination of present and future technological information relating to

  (i) exploration for oil sands deposits and the recovery and processing of oil sands products,

  (ii) the recovery and processing of crude oil and products derived from crude oil,

  (iii) environmental conservation in connection with those exploration, recovery and processing operations, and

  (iv) the production and transportation of synthetic crude oil and other oil sands products and of crude oil and products derived from crude oil,

may be achieved;

(d) co-operation among the Government of Alberta, industry, universities and other institutions or agencies in respect of matters under this Act may be established, furthered and maintained;

(e) technological problems impeding the development of production capacity to meet the demand for synthetic crude oil, crude oil and products derived from crude oil may be solved or alleviated;

(f) technological methods and technological information acquired or developed in respect of matters under this Act may be further developed for any purpose;

(g) technological methods and technological information acquired or developed in respect of matters under this Act may be provided to persons, industries and other institutions or agencies for any purpose.

A.1.21 THE OIL SANDS CONSERVATION ACT

1. **Purposes of the Act - Section 3**

   The purposes of this Act are

   (a) to effect conservation and prevent waste of the oil sands resources of Alberta,

   (b) to ensure orderly, efficient and economical development in the public interest of the oil sands resources of Alberta,

   (c) to provide for the appraisal of Alberta's oil sands resources,

   (d) to provide for appraisals of oil sands, crude bitumen, derivatives of crude bitumen and oil sands product requirements in Alberta and in markets outside Alberta,

   (e) to assist the Government in controlling pollution in the development and production of the oil sands resources of Alberta,

   (f) to provide for the recording and for the timely and useful dissemination of information regarding the oil sands resources of Alberta, and

   (g) to ensure the observance, in the public interest, of safe and efficient practices in the exploration for and the recovery, storing, processing and transporting of oil sands, discard, crude bitumen, derivatives of crude bitumen and oil sands products.

2. **Inspections and Investigations - Section 8**

   (1) At any reasonable time, a member of the Board, or a person authorized by the Board, when acting in the performance of any duties or when exercising any powers under this Act,

   (a) shall have access to an oil sands site, and to any facilities used in connection with operations at an oil sands site,

   (b) may make inspections, investigations or tests and take samples at an oil sands site, and

   (c) may examine all books, records and documents pertaining to operations at an oil sands site.

3. **Stop Orders - Section 9**

   (1) If it appears to the Board, or a person authorized by the Board, that in respect of any construction or operation at an oil sands site there has been or is a contravention of, or a failure to comply with, any provision of this Act, the regulations or an approval, order, direction, term or condition of the Lieutenant Governor in Council or the Board, or that a method or practice employed or any equipment or facility at the oil sands site is hazardous, inadequate or defective, the Board, or the person authorized by the Board, may, by order, direct that the contractor, operator or owner of the oil sands site shall

   (a) adopt methods or use equipment approved by the Board or take remedial measures before proceeding further with the construction or operation, or

   (b) suspend the construction or operation in whole or in part.

   (2) Where the Board, or a person authorized by the Board, makes an order under subSection (1), it or he shall, as soon as possible, advise the contractor, operator or owner in writing setting out the reasons for its action.

   (3) If the Board, or a person authorized by the Board, has made an order under subSection (1), the Board on its own initiative may, or at the request of a person directly affected by the order shall, hold an inquiry within a reasonable time of the date of the making of the order or of the request of that person, as the case may be, to investigate the circumstances leading to the making of the order.

   (4) After an inquiry under subSection (3), the Board may

   (a) renew or rescind the order issued under subSection (1), or

   (b) take any other action or make any other order not inconsistent with this Act that it considers to be warranted by the circumstances.

4. **Approval of Scheme or Operation - Section 10**

(1) No person shall

(a) construct facilities for a scheme or operation, or

(b) commence or continue a scheme or operation

for the recovery of oil sands or crude bitumen, unless the Board, on application, has granted an approval in respect of the scheme or operation.

(2) The Board shall, on receiving an application referred to in **subsection** (1), make any investigations or inquiries and hold any hearings that it considers necessary or desirable in connection with the application.

(3) The Board may, with respect to an application referred to in **subsection** (1),

(a) if in its opinion it is in the public interest to do so, and with the prior authorization of the Lieutenant Governor in Council, grant an approval on any terms and conditions that the Board considers appropriate,

(b) refuse to grant an approval,

(c) defer consideration of the application on any terms and conditions that the Board may prescribe, or

(d) make any other disposition of the application that the Board considers to be appropriate.

(4) An authorization of the Lieutenant Governor in Council is subject to any terms and conditions prescribed by the Lieutenant Governor in Council.

(5) Notwithstanding subsections (3) and (4), the authorization of the Lieutenant Governor in Council is not required under this Section in respect of

(a) an approval of an experimental scheme where the total quantity of energy, as estimated by the Board, in the oil sands, crude bitumen or derivatives of crude bitumen recovered in any year will not exceed 12.5 petajoules, or

(b) an approval of a scheme or operation, other than an experimental scheme, where the total quantity of energy, as estimated by the Board, in the oil sands, crude bitumen or derivatives of crude bitumen recovered in any year will not exceed 5 petajoules.

5. **Approval Respecting Processing Plant - Section 11**

(1) No person shall construct or operate a processing plant unless the Board has, on application, granted an approval in respect of the processing plant.

(2) The Board shall, on receiving an application referred to in subSection (1), make any investigations or inquiries and hold any hearings that it considers necessary or desirable in connection with the application.

A.1.22 THE PIPELINE ACT, 1975

This Act provides for the permitting for the construction and the licensing for the operation of all pipelines in the Province. The Act requires that the Board refer all applications to the Minister of the Environment for approval. The specific requirements of that Department pertaining to matters related to the environment are set forth earlier in this synopsis, however, your attention is drawn to the Regulated Oil and Gas Pipeline Surface Operation Regulations.

1. **Investigation by the Board – Section 5**

The Board, when required by the Lieutenant Governor in council shall, or upon its own motion may, inquire into, examine and investigate any matter relating to

(c) the control of pollution and conservation of the environment in the development and operation of pipeline facilities.

2. **Approval of a Permit – Section 8**

(1) The Board shall refer an application for a permit or an amendment of a permit to the Minister of the Environment and the Minister of Energy for their approval of the application as it affects matters of environment.

(2) The Minister of the Environment and the Minister of Forestry, Lands and Wildlife or either of them may give their approval with or without conditions, but where conditions are imposed, the Board shall, if it grants a permit or an amendment of a permit, make the permit or amendment subject to the same conditions imposed by the Minister of the Environment or the Minister of Forestry, Lands and Wildlife, or both of them, in giving their approval.

(3) Notwithstanding **subsection** (1), the Minister of the Environment or the Minister of Energy may direct that an application for a permit or for an amendment of a permit for any pipeline or any type of pipeline specified by him be not referred to him.

(4) The Minister of the Environment or the Minister of Forestry, Lands and Wildlife may authorize an officer of his department to exercise the powers conferred on him by this Section.

3. **Leaks and Breaks – Section 36**

(1) When a leak or break occurs in a pipeline, the permittee or licensee shall immediately cause the Board to be informed of the location of the leak or break.

(1.1) Where contact is made with a pipeline during any ground disturbance, resulting in a puncture of, or crack in the pipeline or in a scratch, gouge, flattening or dent on the surface of the pipeline, or in damage to its protective coating,

(a) the particular ground disturbance that resulted in the contact with the pipeline shall be immediately stopped and the person responsible for the ground disturbance shall immediately advise the permittee or licensee of the pipeline of the location where the contact occurred and the kind of damage that resulted from the contact, and

(b) the permittee or licensee of the pipeline shall immediately notify the Board of the location where the contact occurred and the kind of damage that resulted from the contact.

(1.2) Where a particular ground disturbance has been stopped pursuant to **subsection** (1.1) it shall not be recommenced without the approval of the permittee or licensee of a pipeline with which contact was made or, if approval cannot be reasonably obtained from the permittee or licensee, without the approval of the Board.

(2) When a leak or break in a pipeline or damage to a pipeline that resulted from a contact described in **subsection** (1.1) has been repaired, the Board may require the submission of reports in writing, in accordance with the regulations.

(3) When a pipeline that is transmitting oil breaks on Crown land or in a forested area, the licensee shall immediately report the location of the break and the approximate quantity of oil that has escaped to an employee or officer of the Department of Energy and Natural Resources.

(4) The provisions of this Section extend to a pipeline for which there is in force a certificate or an order exempting the pipeline from a certificate made or issued by the National Energy Board under the National Energy Board Act (Canada) and to the person constructing or operating the pipeline as though that person was the permittee or licensee, as the case may be, of the pipeline.

4. **Clean up of Spills – Section 37**

(1) When a substance escapes from a pipeline and it appears to the Board that such substance may not otherwise be contained and cleaned up forthwith, the Board may

(a) direct the pipeline operator or licensee, or such pipeline operators or licensees who in the opinion of the Board could be responsible for a pipeline from which the substance escaped, to take any steps that the Board considers necessary to contain and clean up, to the satisfaction of the Board and the Department of the Environment, the substance that has escaped and to prevent further escape of the substance, or

(b) enter upon the area where the substance has escaped and conduct such operations as it considers necessary to contain and clean up the substance that has escaped and to prevent further escape of the substance.

(2) Where the Board enters upon an area pursuant to **subsection** (1), clause (b),

(a) every person responsible for the escape of the substance, every pipeline operator or licensee who in the opinion of the Board could be responsible for a pipeline from which the substance escaped and every officer and employee of such person, operator, or licensee shall, until the operations to be conducted by the Board are completed, obey the orders concerning such operations given by the Board or such person or persons as the Board places in charge of such operations;

(b) the Board may recover, deal with and dispose of the escaped substance as if it were the property of the Board, and if any such substance is sold, apply the proceeds to pay the costs and expenses of the operations conducted by the Board;

(c) the Board may engage such persons as it considers necessary to conduct any of the operations on its behalf.

(3) Where any operations are conducted pursuant to this Section

(a) by an operator, licensee or other person under **subsection** (1), clause (a) and the operator, licensee or person requests the Board to do so, or

(b) by or on behalf of the Board under **subsection** (1), clause (b), the Board may determine the costs and expenses of such operations and direct by whom and to what extent they are to be paid.

(4) No action or proceeding may be brought against a person named in a direction issued pursuant to **subsection** (1), clause (a) in respect of any act or thing done pursuant to the direction.

A. Pipeline Regulations 28/86

Amends 295/75 – Forms and prescribing fees.

B. Pipeline Regulations – Alberta Regulations 122/87

1. Application for Permit to Construct Pipeline – Section 2

(1) Unless otherwise directed by the Board, an application under Part 4 of the Act for a permit to construct a pipeline shall include

(a) a statement indicating the necessity and purpose of the proposed pipeline,

(b) 1 copy of the application form as set out in Schedule 3,

(c) 4 copies of the applicable and most recent Board Pipeline Base Map showing the proposed line in red, and the designated line number, determined by using the procedures in the Pipeline Information System Users Manual, Guide G-13,

(d) a statement that easements, working space or consents of landowners and occupants have been obtained,

(e) if any easements, working space or consents have not been obtained, a listing of the parcels of land concerned, and the names, addresses and telephone numbers of the landowners and occupants of such parcels,

(f) if a pipeline is proposed to traverse vacant Crown land, a statement indicating whether a surface use application has been made to the Department of Forests, Lands and Wildlife,

(g) if a pipeline is proposed to traverse occupied Crown lands, a statement indicating that all occupants have been notified and do not object to the issuance of the permit for the proposed pipeline,

(h) if the approval is required to replace extensive Sections of line for repair or maintanance, to replace the pipeline entirely, to loop the existing line within the existing easement or to place an additional line in an existing right of way, a statement to confirm that the landowner and occupant has no objection to the new construction,

(j) if it is proposed to place a pipeline in an access road to a well site or other site, a statement that the surface lease or right of entry order for the access road includes provision for the proposed pipeline and associated facilities, and confirmation that the landowner or occupant will be advised of the proposed construction.

(2) In additon to the requirements of **subsection** (1), and application for a permit to construct a pipeline to transmit gas containing more that 10 moles of hydrogen sulphide gas per kilomole of natural gas or any lesser hydrogen sulphide content that the Board may stipulate in a particular case shall include the following:

(a) a drawing of any site facilities showing the proposed layout of the facilities and the specifications, pressure ratings and intended operating pressure of all pipe, valves and fittings to be utilized;

(b) the maximum and minimum temperatures of the gas to be transmitted in the proposed pipeline;

(c) a chemical analysis of the gas to be transmitted;

(d) a description of any leak detection system;

(e) any information requiried to ensure conformance to the material requirements of the Canadian Standards Association Standard CAN/CSA Z184

(f) evidence that all emergency shutdown devices will fail closed;

(g) the volume, expressed in cubic metres at standard atmospheric conditions, of any potential release of hydrogen sulphide from the proposed pipeline, calculated using the maximum applied-for operating pressure;

(h) a plan showing the location of individual permanent dwellings, industrial or commercial development, unrestricted country development and public facilities within the distances specified by the Board in the applicable Interim Directive.

2. Application to Construct Compressor Station, Pump Station, etc. – Section 3

An application for a permit to construct a gas compressor station, an oil pumping station or a water injection station shall include

(a) 1 copy of the application form as set out in Schedule 3,

(b) 4 copies of the more recent Board Pipeline Base Map showing the proposed site outlined in red, and

(c) a statement concerning the present land use and the designated land use by any zoning authority within a 1.5 kilometre radius of the station, and the extent of communications held with the residents in the vicinity of the proposed station, advising them of the proposed station.

3. Protection Against Corrosion – Section 12

(2) Appropriate methods to detect mitigate internal corrosion shall be employed to protect pipelines transmitting any liquid or gas or combination thereof which may cause the interior to corrode.

4. Stress Level Limitations – Section 13

For pipelines transitting gas with a content of more than 10 moles of hydrogen sulphide gas per kilomole of natural gas

(a) the design stress levels shall not be greater than
  (i) 60% SMYS for all underground piping, and
  (ii) 50% SMYS for all above ground piping,

(b) block valves and check valves shall be so located that in the event of a pipeline failure the emission of hydrogen sulphide gas will not exceed a volume acceptable to the Board, and

(c) emergency shutdown devices shall be designed to close on failure of any control or operating component.

5. **Operating and Maintenance Manual – Section 49**

(1) A licensee shall develop and maintain a manual of operating and maintenance procedures for all licensed pipelines.

(2) The manual referred to in **subsection** (1) shall be submitted the Board upon request.

6. **Emergency Procedures Manual – Section 50**

(1) In addition to the manual required by Section 49, a licensee of a pipeline transmitting gas containing more than 10 moles of hydrogen sulphide gas per kilomole of natural gas shall maintain an emergency procedures manual for
  (a) assessing an emergency situation from available information when there is an uncontrolled emission of gas from the pipeline,
  (b) mobilizing field and plant personnel,
  (c) co-ordinating control measures in an emergency situation,
  (d) setting up lines of communication and responsibilities, and
  (e) any other matters concerning actions necessary to ensure public safety.

(2) The emergency procedures manual referred to in subSection (1) shall be updated at least once each year and submitted to the Board upon request.

7. **Periodic Inspection for Internal Corrosion Mitigation – Section 53**

(1) In addition to the requirements of Section 52, a licensee of a pipeline that transmits gas containing more than 10 moles of hydrogen sulphide gas per kilomole of natural gas shall conduct periodic inspections or tests to determine the effectiveness of measures taken to control internal corrosion.

(2) The results of the inspections or tests required by **subsection** (1) shall be recorded and the records shall be submitted to the Board upon request.

8. **Leaks and Breaks – Section 54**

If oil, salt water or other deleterious liquids escape from a leak or break in a pipeline, the permittee or licensee shall take immediate steps to stop the source of release, and contain and clean up the spill.

9. **Report of Leak or Break – Section 55**

(1) When requested by the Board, after a leak, break or contact damage has been repaired, the permittee or licensee shall make a report in writing the Board showing
  (a) the time the leak, break or contact damage occurred,
  (b) the approximate quantity of substance lost,
  (c) the method of repair,
  (d) the conditions that caused or contributed to the leak, break or contact damage, and any substantiating reports,
  (e) the steps to be taken to prevent similar future occurrences, and
  (f) such other information as the Board requires.

(2) Without limiting **subsection** (1), if

(a) more than 2 cubic metres of oil, salt water or other deleterious liquids escape from a pipeline, or

(b) any oil, salt water or other deliterious liquids escape beyong the pipeline right of way,

the Board may require additional information concerning the spill containment and recovery procedures and an outline of the proposed spill site rehabilitation program.

10. **Intentional Release of Gas – Section 57**

Gas containing more that 0.16 moles of hydrogen sulphide gas per kilomole of natural gas shall not be released from a pipeline intentionally without the consent of the Board unless the gas is burned in an approved manner.

A.1.23 THE PUBLIC HEALTH ACT

The excerpts from The Public Health Act are environmentally oriented and applicable to the oil and gas industry.

A. **Public Health Regulations – Section 75**

1. The Lieutenant Governor in Council may make regulations

(g.1)prescribing the maximum level of contaminants permissible in air or water;

A.1.24 THE PUBLIC HIGHWAYS DEVELOPMENT ACT

This Act covers the construction and maintenance of highways within the Province and empowers the Minister to prescribe terms and conditions of use while conducting geophysical exploration.

A.1.25 THE PUBLIC LANDS ACT

This Act covers the administration and disposition of public lands within the Province and empowers the Minister to prescribe terms and conditions pertaining to use thereof, with particular reference to geophysical exploration.

A. **Exploration Regulation – Alberta Regulation 423/78, Amended by 237/79, 302/81, 40/82, 418/82**

B. **The Mineral Surface Lease Regulation 228/58, 77/61, Amended by 252/64, 582/65, 292/87**

C. **Regulations Governing the Issues of Licences of Occupation on Public Land 448/81, Amended by 41/82, 293/87**

D. **The Public Lands Pipeline Regulations 246/58, Amended by 99/59, 79/61, 264/61, 251/64, 289/87**

E. **The Public Lands Act Surface Materials Regulations 11/78, Amended by 44/78, 116/87**

A.1.26 THE WATER RESOURCES ACT

The following excerpts from The Water Resources Act and corresponding Regulations are environmentally oriented and applicable to the oil and gas industry.

1. **Definitions – Section 1**

In this act:

(v) "water" means all water on or under the surface of the ground;

(f) "divert" means

(i) to impound, store, take or remove water for any purpose or

(ii) to do any act that has the effect of altering the flow of water or changing the location of water or the course of flow of water

and "diversion" has a corresponding meaning.

2. **Diversion of Water – Prohibitions – Section 5**

(1) No person shall

(a) divert or use any water,

(b) construct or cause to be constructed any works for the diversion of water or which are or may be or may become capable of diverting water,

(c) operate or use any works for the diversion of water,

(d) lay, place, build or erect in, over, under, on or adjacent to any water any structure, device, contrivance or thing, or any earth, sand, gravel or other material, which interferes with or is capable of interfering with the present or future development, conservation or management of water, or

(e) remove or disturb any earth, sand, gravel or other material forming part of the bed, shore or banks of any water, if the removal or disturbance interferes with or is capable of interfering with the present or future development, conservation or management of water,

except under the authority of this Act, the regulations or a licence, interim licence or permit issued under this Act.

(2) A person who contravenes subsection (1) is guilty of an offence.

(3) Each day or portion thereof that a person contravenes subsection (1) shall be deemed to be a separate offence.

(4) A prosecution for a contravention of subsection (1) may be commenced within 3 years after the commission of the offence, but not afterwards.

3. **Acquisition of Rights – Exploration Permit – Section 15**

(1) An applicant for a licence or permit referred to in Section 11(1) shall file with the Minister an application in writing in the form and containing the particulars that the Minister may from time to time prescribe and shall set out the nature of the proposed diversion or works and the purpose thereof.

(2) The Minister may in his discretion grant to the applicant an exploration permit on any condition he thinks fit authorizing the applicant to make all necessary examinations and surveys to prepare plans and Sections showing the extent of the proposed diversion.

(3) The term of an exploration permit shall be one year from its date but the Minister may from time to time extend the term for a period not exceeding one further year.

(4) The person to whom an exploration permit is granted is entitled, with any assistants that are necessary, to enter into and on any public or private land to take levels, make surveys and do other necessary work for the purpose of completing the examination and survey authorized by the permit.

(5) No unnecessary damage shall be done on or to public or private land in entering thereon or in taking levels, in making surveys or in doing other necessary work for the purpose of completing the examination and survey authorized by the permit.

(6) The applicant, after completing the preliminary examination and survey, may file with Minister an application for a licence, in the form and containing the particulars that the Minister may require, setting out the nature and extent of the proposed diversion of works.

(7) If the purpose for which the right of diversion is required is the development of water-power, the applicant shall comply with all the provisions of Part 2.

(8) Except in the case of a diversion for water-power, the applicant shall, with his application for a licence, file with the Minister

(a) a full description, with such detailed plans and specifications as the Minister may require, of all works that are necessary for the utilization of the diverted water, and

(b) in respect of any proposed canal, ditch, reservoir or other works that it is proposed to construct on, along, across or under a road allowance, public highway, square or other public place that may be affected by the works, the permission in writing

(i) from the municipal or other authorities having jurisdiction over the road allowance, public highway, square or other public place, or

(ii) from the Board as provided in Section 22, if that permission can then be obtained.

(9) Notwithstanding anything in this Act, no person is entitled to apply for a licence under Section 11(1), to divert and use ground water unless he has

(a) obtained an exploration permit under this Section pertaining to an examination and survey of the source of such ground water, and

(b) has complied with the exploration permit, this Section and the regulations,

and subsections (1) to (6) apply to the application and the exploration permit.

A. The Water Resource Regulations – Alberta Regulation 91/58

Amended by 328/62, 187/65, 38/66, 401/78

Application forms in current use:

(a) Application for Licence pursuant to Section 11 (1)(a)(b)(c) of the Water Resources Act. (Form WR1, available from Alberta Environment for uses of water such as hydrostatic testing, steam injections, and other long term uses.)

(b) Application for Exploration Permit pursuant to Section 15 of the Water Resources Act. (Form WR1C, available from Alberta Environment.)

(c) Application for Permit pursuant to Section 11(1)(e) of the Water Resources Act. (Form WR1B available from Alberta Environment for such activities as pipeline or vehicular stream crossings.)

(d) Application for Drainage Licence pursuant to Section 11 (1)(d) of the Water Resources Act. (Form WR1A, available from Alberta Environment for erosion protection works, channel diversions, drainage, stream cut-offs, etc.)

(NOTE: forms WR1, WR1C, and WR1B and WR1A are included in Appendix D.)

APPENDIX A2

MUNICIPAL BYLAWS

Appendix A2

TABLE OF CONTENTS

APPENDIX A2 MUNICIPAL BYLAWS

I. Counties
II. Municipal Districts
III. Improvement Districts

A2. MUNICIPAL BYLAWS

Bylaws and Requirements – Counties, Municipal Districts & Improvement Districts

The following questionnaire was sent to all Counties, Municipal Districts and Improvement Districts in the province of Alberta.

a. With respect to your bylaws, what delays in constructing an industrial project could be circumvented by pre-planned procedures?

b. What procedures could industry follow to assure an amicable presence while conducting land surveys, geophysical, drilling, production, pipelining and reclamation activities?

c. Any specific access requirements?

d. Other?

e. Please explain if the above questions do not, for any reason, apply to your situation.

The text used in the following pages is directly from the responses of the questionnaire. As a result the format is slightly different for each municipality as the format of the responses was different from each municipality. Accuracy in repeating the response, however, has been maintained.

The Counties, Municipal Districts and Improvement Districts within the province are as follows:

I. COUNTIES

1. Athabasca
2. Barrhead
3. Beaver
4. Camrose
5. Flagstaff
6. Forty Mile
7. Grande Prairie
8. Lac Ste. Anne
9. Lacombe
10. Lamont
11. Leduc
12. Lethbridge
13. Minburn
14. Newell
15. Paintearth
16. Parkland
17. Ponoka
18. Red Deer
19. Smoky Lake
20. St. Paul
21. Stettler
22. Strathcona
23. Thorhild
24. Two Hills
25. Vermilion River
26. Vulcan
27. Warner
28. Wetaskiwin
29. Wheatland

II. MUNICIPAL DISTRICTS

1. Acadia
2. Bonnyville
3. Cardston
4. Clearwater
5. Cypress
6. Foothills
7. Kneehill
8. Peace
9. Pincher Creek
10. Provost
11. Rocky View
12. Smoky River
13. Spirit River
14. Starland
15. Sturgeon
16. Taber
17. Wainwright
18. Westlock
19. Willow Creek

III. IMPROVEMENT DISTRICTS

1. Big Horn
2. Calgary
3. Canmore
4. Drumheller
5. Edson
6. Fort McMurray
7. Fort Vermilion
8. High Prairie
9. Lac La Biche
10. Medicine Hat
11. Peace River ID 17W
12. Peace River ID 21 and 22
13. Slave Lake
14. Spirit River
15. Valleyview
16. Whitecourt
17. Bow/Crow Forest

Contacts for each of the Municipalities can be found in Appendix C.

I. COUNTIES

1. ATHABASCA (County No. 12)
    - a. Controls on industrial projects are presently under review by the General Municipal Plan Committee and for the Land Use By-Law.
    - b. Provide information on any new pipelines well in advance of construction.
    - c. Access should be to the specifications and satisfaction of the County on Secondary Roads only.
    - d. Pipelines across watercourses should be placed at sufficient depth in case of new drainage work or required maintenance of creek channels.

2. BARRHEAD (County No. 11) – No reply.

3. BEAVER (County No. 9)
    - a. We require a development permit under our Land Use By-Law.
    - b. Development permits should be obtained well in advance of proposed development in order for the advertising and appeal process to be concluded before development.
    - c. Any road crossing by pipelines must be bored unless other arrangements have been approved.

4. CAMROSE (County No. 22)
    - a. Some controls which could delay an industrial project within this county are as follows:
        - (i) land-use bylaw #672 (development permits required for all developments – not exempted by the Alberta Planning Act)
        - (ii) road crossing regulations (governs all pipelines – advance approvals required)
        - (iii) overload permits (trucking – obtained from Public Works Department)
        - (iv) local road bans (because of conditions due to excess rain or spring thaw)

      Notice of a proposed project to the County as soon as possible helps to avoid delays later. Construction scheduled for spring can be hampered by road bans due to thawing conditions.
    - b. Many problems which arise as a result of land survey, geophysical operations, drilling, production, piping and reclamation activities, etc. are due simply to a lack of communication between industry and land owners, adjacent land owners, municipalities, etc.

c. Industry should better inform themselves regarding Provincial regulations and always contact the municipal office, allowing sufficient lead time before the start of a project.

The location of new approaches is a great concern to the municipality since the improper choice of a location can be very hazardous to motorists, such as site line, and distances from other approaches and crossroads. A development permit must be obtained prior to installation of any approach of structure of any kind within a county road allowance. (Pipelines crossing a road do not require a development permit, but must have municipal approval pursuant to the municipal road crossing regulations and pipeline act.) Depending on the location, the municipality may require the installation of culverts and gravel, etc. As mentioned previously, many, if not all problems between the industry and land owners, municipalities, etc. can be alleviated by more direct contact and communications, well in advance of the project start up.

5. FLAGSTAFF (County No. 29)

Moving heavy equipment and pipes: County Bylaw No. 314 provides for regulating and controlling the use of highways and roadways within the County of Flagstaff No. 29. A permit must be obtained before entering the County. This permit may be obtained, free of charge.

Land Use By-law No. 519: An application must be made for a permit to erect any building or other development. Permit fees available with application forms. Under this by-law no structure may be erected within 60 metres (197 feet) of the centre line of any Provincial Primary or Secondary Highway or 50 metres (164 feet) of the centre line of any other road. It takes about three weeks for development approval. For further particulars contact the County Office.

Pipeline Road Crossings: A copy of the regulations of the County of Flagstaff No. 29 covering pipeline road crossings follows. A request to cross a road allowance must be made in writing, accompanied by a preliminary survey drawing. Permission is usually granted within two weeks. However, if there is a time limit that approval must be given sooner, Flagstaff County will act between Council meeting days.

Approaches to Lease Roads, etc.: The County must be consulted before construction of approaches to lease roads are made. These approaches must be placed where there is good visibility and not constitute a hazard to the travelling public. Culverts must be installed if necessary. A Company may, upon application, construct a road on an unimproved road allowance. This road must meet requirements set forth by the Council. Texas gates may be installed upon application.

These regulations shall govern standards and procedures used in the construction, maintenance and operation of pipelines and/or integral parts thereof, or extensions thereto within the County. Provincial regulations must be followed at all times.

1. Definitions

In these regulations:

1.1 "Council" means the Council of the County.

1.2 "Road crossing" means any pipe installed across a road to convey gas, oil, water, sewage, etc.

1.3 "Secondary Road" means all numbered roads other than primary provincial highways.

1.4 "Oiled or Light Surface Roads" means roads which have a light asphalt or oiled surface.

1.5 "Local roads" means all roads other than numbered roads and highways and light surfaced or oiled roads.

1.6 "Unimproved Road Allowances" means road allowances to which no improvements have been made in the way of road construction.

1.7 "Punched/Bored" means a procedure used to establish passageway through a road bed using either an auger or a pneumatic type of equipment, eliminating the necessity of open cut/trenching.

1.8 "Open Cut/Trenching" means open trenching a passageway through a road surface or other surface and down to the required depth, as opposed to Punched/Bored.

1.9 "Plough (plow)" means a pull type or self propelled machine which is used in the planting or burying of plastic or aluminum pipe in the ground in a continuous one step operation, eliminating trenching and back-filling.

1.10 "Approved" or "Otherwise Approved" means approval by Council and/or authorized personnel of the County.

1.11 "Pipeline" means any piping system, as set forth in the pipeline act Chapter 275 of the Alberta Statutes 1970 and Amendments thereto, used in the transmission, gathering and/or distribution of gas, oil, water, sewage, mineral, etc., either steel or plastic (fiberglass) pipe.

1.12 "Owner" means the owner and/or operator of a pipeline or integral parts thereof.

2. Pipelines

2.1 All pipelines paralleling road allowance, either improved or unimproved, in the County, shall not at any point be nearer than 33 m (100 feet) to the boundary of the road allowance, unless otherwise approved. (See paragraph 1.10)

2.2 Where a pipeline crosses a road, no bends shall be permitted in that portion of the boundaries on either side of the road allowance, without being approved (See paragraph 1.10)

2.3 The County shall be supplied with a detailed map, plans and drawings for approval of all proposed pipelines and/or extensions or revisions thereto, prior to commencement of any construction. These drawings shall show location(s) of proposed road crossing(s).

2.4 The County shall not be liable for any damage, injury or other costs of inconvenience arising from the construction maintenance or operation of any pipeline or integral part thereof within the County.

2.5 All pipeline rights-of-way shall be restored to their original condition, or to the satisfaction of the Council.

3. Road Crossings

3.1 If deemed necessary, Council and/or authorized personnel may inspect proposed crossing locations with representative(s) of the pipeline owner or contractor concerned.

3.2 All roads shall be punched from shoulder to shoulder unless otherwise approved (See paragraph 1.10)

3.3 All roads approved for open cut trenching (see paragraph 3.2 above), shall be well tamped throughout the backfilling operation, and 4.6 m^3 (6 $yards^3$) of crushed gravel be spread over affected area.

3.4 Maintenance of all road crossings shall be at the expense and the responsibility of the owner.

3.5 The depth of all road crossings shall be 2.1 m (7 feet) below existing ditch bottom unless road improvements are proposed. (See paragraph 3.6 below.) The depth of road crossings shall be maintained throughout the entire width of the road allowance or proposed road allowance and for one (1) road on each side of the road allowance or proposed road allowance boundaries.

3.6 Road crossings may be installed at a lesser depth than that set out in paragraph 3.5 but only with the consent of the Councillor for the area concerned and road crossings under roads which are to be improved may be required to be installed deeper to prevent damage to the pipe. The depth of these installations shall be determined individually and the expense of the deeper installations shall be borne by the Owner.

3.7 All road crossings of secondary, oiled or light surfaced and other local roads which carry a substantial amount of heavy traffic (to be determined by the council and/or authorized personnel) shall either be series 160 polyethylene plastic, or equivalent, or shall be steel pipe, as set down in the latest edition of related CSA codes and the Energy Resources Conservation Board of Alberta. Both types of crossings shall extend throughout the entire width of the road allowance.

3.8 All other road crossings of improved roads shall not be less than series 160 polyethylene plastic, or equivalent pipe as determined by the Energy Resources Conservation Board and the latest edition of the related CSA codes. This type of pipe shall extend throughout the entire width of the road allowance.

3.9 On unimproved road allowances, (see paragraph 1.6) the same type and thickness of pipe, and the same method of installation as used off the road (private lands), may be used to cross, providing a proper road crossing be installed, at the expense of the pipeline owner, should the road be improved at a later date.

3.10 All road crossings shall be as near 90 degrees to the road allowance as possible, and properly marked by warning signs. (See paragraph 2.2)

3.11 Road crossings shall be installed in a manner which will cause the least inconvenience to the travelling public.

3.12 Where traffic is to be detoured around any area, due to work being performed on a pipeline or integral part thereof, a detour shall be provided and adequately maintained, with ample signs, etc., being erected throughout. During the hours of darkness, all warning and detour signs and excavations shall be illuminated by flares.

3.13 Open trenches that cross the travelled portion of a road shall not be left unattended unless a detour has been provided.

3.14 Council and/or authorized personnel shall mark on a map, the method of installing road crossings, type of crossing (steel or plastic) and width of road allowance or proposed road allowance concerned.

4. General

4.1 The County officials or the utilities officer shall be notified before plowing in of cable is commenced or before crossing road allowances.

4.2 Upon installation and before the trench is backfilled, the road crossing must be inspected by an authorized County official. An inspection report in duplicate must be completed and presented to the County official for signature.

4.3 The owner of the pipeline shall be responsible for all expenses incurred to lower or alter location, if necessary, due to future road improvements.

4.4 The road allowance shall be restored by the owner of the pipeline to its original condition, including the resetting of grass where the ground has been disturbed.

Communication is the most important factor in areas for orderly development of proposals. We would suggest the following:

1. Letter to County Office outlining the proposal as soon as possible.
2. Follow up with a visit to the County Office to discuss the plans in detail.
3. Maintaining communication throughout all phases of planning and construction.
4. The visit to various landowners concerned by a pleasant, knowledgeable landman, who informs of the plans, giving the farmer ample time to review with his solicitor if required. Public relations is the most important factor.

For further information, consult the County's Land Use By-Law.

6. FORTY MILE (County No. 8)

These regulations shall govern standards and procedures used in the construction, maintenance and operation of pipelines and/or integral parts thereof, or extensions thereto within the County. Provincial regulations also be followed at all times.

1. Definitions

1.1 "Council" means Council of the County.

1.2 "Road Crossing" means any pipe installed across a road to convey gas, oil, sewage, water, etc.

1.3 "Secondary Roads" means all numbered roads other than primary provincial highways.

1.4 "Oiled or light surface roads" means roads which have a light asphalt or oil surface.

1.5 "Local Roads" means all roads other than those mentioned in 1.3 and 1.4.

1.6 "Unimproved road allowance" means allowances which have no constructed roads on them.

1.7 "Punched/Bored" means pneumatic or auger equipment used to obtain passage under road bed without disturbing surface.

1.8 "Open Cut/Trenching" means an open cut ditch across road bed through road surface.

1.9 "Plough" means a pull type or self propelled machine used to bury plastic pipe or aluminum pipe in the ground in a continuous one step operation thus eliminating trenching and backfilling.

1.10 "Approved or otherwise" means approval by Council and/or authorized personnel of the County.

1.11 "Pipeline" means any piping system as set forth in the Pipeline Act Chapter 275 of the Alberta Statutes 1970 and Amendments thereto, used in the transmission or gathering and/or distribution of gas, oil, water, sewage, mineral, etc., either steel or plastic pipe.

1.12 "Owner" means the owner and/or operator of a pipeline or integral part thereof.

2. Pipelines

2.1 All pipelines paralleling road allowances either improved or unimproved in the County, shall not be nearer than 33 m (100 feet) to the boundary of road allowances at any point, unless otherwise approved (See paragraph 1.10).

2.2 Where pipelines must cross a road, no bends shall be permitted in that portion of the pipeline within the boundaries of the road allowance or within 33 m (100 feet) of the boundaries on either side of the road allowance without being approved.

2.3 The County shall be supplied with a detailed map, plans and drawings for all proposed pipelines and/or extensions or revisions thereto, prior to any construction. These drawings shall show location(s) of proposed road crossing(s).

2.4 The County shall not be liable for any damage, injury or other costs of inconvenience arising from the construction, maintenance or operation of any pipeline or any integral part thereof within the County.

2.5 All pipeline right of ways shall be restored to their original condition or to the satisfaction of the Council.

3. Road Crossings

3.1 If deemed necessary Council and/or authorized personnel may inspect proposed or installed crossings at any time with representatives of the pipeline owner or contractor concerned.

3.2 All roads must be punched from shoulder to shoulder unless otherwise approved.

3.3 All roads approved for open cut trenching, shall be well tamped throughout the backfilling operation and as much gravel as Council sees fit be spread over area.

3.3.1 The above mentioned roads will be the responsibility of the owner for a period of one year after date of completion or if the County is forced to make repairs from time to time in this period the owner will be charged accordingly.

3.3.2 Maintenance and expense of all road crossings shall be at the expense of the owner.

3.4 The depth of all improved road crossings shall be 1.2 m (4 feet) below existing road bottom, unless improvements to road are proposed in near future. The depth shall be maintained throughout the entire road allowance.

3.4.1 Road crossings which are to be improved, may be required to be installed deeper to prevent damage to pipe. These installation depths shall be determined individually and the expense shall be borne by the owner.

3.4.2 The depth of all unimproved road crossings shall be 1.8 m (6 feet) below ground level. The depth shall be maintained throughout the entire road allowance.

3.5 All road crossings of secondary, oiled or light surfaced and other local roads which carry a substantial amount of heavy traffic (to be determined by Council and/or authorized personnel) shall either be series 160 polyethylene plastic, or equivalent in a steel case, or shall be steel pipe, as set down by the C.S.A. Code and E.R.C.B.

3.5.1 All other road crossings of improved roads shall be not less than series 160 plastic pipe or as set down by C.S.A. or E.R.C.B.

3.5.2 On unimproved road allowances the same type of pipe may be used as field ploughing and may be ploughed in as same, providing a proper installation be made, in case improvements are made to the road, at the cost of the owner.

3.5.3 All road crossings must be installed as near to 90 degrees as possible.

3.5.4 All lines crossing a road allowance must be marked and maintained by the owner at the owner's expense as required by Section 28 Subsection 1 of The Pipe Line Act Chapter 275 of the Revised Statutes of Alberta 1970 and the Amendments thereto.

3.5.5 No line shall cross any County road allowance on the crest of a hill unless special approval has been authorized by the County.

3.6 Road crossings shall be installed in a manner so as not to cause inconvenience to the public.

3.6.1 Where a detour is necessary, a properly maintained detour must be provided. Signs and warnings must also be put up.

3.6.2 All detours and responsibility are at the cost of the owner.

3.6.3 The owner of the line hereby saves harmless the County of Forty Mile No. 8, their officers, and employees from and against all claims, damages, suits, actions and causes of actions or cost that the grantor may suffer or be put to by reason of the County granting permission for the said line crossing a road under County control.

3.6.4 The owner of the line at his own expense shall upon request of the County, its officers, or authorized employees, assist in establishing the location of the said line.

3.6.5 The owner of the line at his own expense shall upon request of the County lower or move the said line where such is required for road construction.

4. Construction

4.1 The County will not be responsible for any backfilling or maintenance of right of ways.

4.2 Any debris must be cleaned up immediately, such as plastic wrappers, etc. which may harm appearance of land or cause harm to animals or human life.

5. Landowners on whose property regulators are to be located in connection with the installation of natural gas distribution line must be given an option as to the location of the set of regulators on their property. The option being having the regulators located on the gas transmission line which is located 13 m (43 feet) inside the property line, or having the regulators located just inside the property line in which case if it becomes necessary at some future date to move the regulators to allow for road construction work the cost of moving the said regulators is the responsibility of the landowner.

7. GRANDE PRAIRIE (County No. 1)

   a) Some controls which could delay an industrial project within this county are as follows:

      (i) land-use bylaw (location and type of development)

      (ii) road crossing regulations (pipeline)

      (iii) overload permits (trucking)

      (iv) local road bans (because of conditions due to excess rain, etc.)

      In order to avoid project delays due to any of the above regulations and possibly others, I suggest that adequate notice of the proposed operations be given to the municipality. If this becomes the standard procedure, then it gives the municipality a chance to review the proposal and comment if necessary.

   b) Many problems which arise as a result of land survey, geophysical operations, drilling, production, piping and reclamation activities, etc. are due simply to a lack of communication between industry and land owners, adjacent land owners, municipalities, etc.

   c) Industry should better inform themselves regarding Provincial regulation and always contact the municipal office, allowing sufficient lead time before the start of a project.

      The location of new approaches is a great concern to the municipality since the improper choice of a location can be very hazardous to motorists, such as site line, and distances, from other approaches and crossroads. Permission must always be obtained prior to installation of any approach of structure of any kind within a county road allowance.

      Depending on the location, the municipality may require the installation of culverts and gravel, etc. As mentioned previously, many, if not all problems between the industry and land owners, municipalities, etc. can be alleviated by more direct contact and communication.

8. LAC STE. ANNE (County No. 28) – No reply.

9. LACOMBE (County No. 14) – No reply.

10. LAMONT (County No. 30)

    a. The Developer is required to obtain a development permit from the County for most types of Industry or Development.

    b. A plan showing the area of operation and equipment to be used, must be filed with the Secretary-Treasurer of the County of Lamont prior to any seismic and or geophysical operations being conducted in the County of Lamont No. 30.

    c. The Geophysical Regulations must all be complied with.

    d. Any damage to the roadway or ditch, is to be repaired to the pre-entry standard and condition.

    e. Any damage to culverts is to be repaired or the culvert replaced.

    f. The County is to be held harmless in any damage claim that may be brought against the County as a result of the operations.

g. If any clearing is to take place on the road allowance, you are required to cut and windrow the trees, brush, etc. on the road allowance and burn same. A Burning Permit may be required, therefore, check what the requirements are.

h. General access – consult with County Administration Office prior to any activity. Blockages in road ditches will not be tolerated. These include approaches without satisfactory culverts being installed.

i. The Councillor of each electoral division must be contacted for permission to move rigs and other heavy equipment over county roads, including numbered Secondary Roads. The Councillor's phone numbers are available at the County Office.

j. Pipeline companies or their consultants are required to submit drawings of proposed pipelines in their entirety for approval prior to pipeline construction. Road crossing requirements will be specified at that time.

k. County inspector must be contacted for inspection of all road crossings to be bored unless otherwise arranged.

l. As much lead time as possible should be given for approvals on all proposed industrial projects.

11. LEDUC (County No. 25)

a) General road usage may be affected by vehicle axle weight loading restrictions. Specific attention is drawn to the following:

   (i) drilling or service rig movements should contact the County's Thorsby Municipal Shop at 789-3777 for current road use information, and,

   (ii) seismic/geophysical operators are requested to provide to the administration office, at least 48 hours in advance, written notification, together with a plan of the proposed project. Written notice of the project's completion is as well required within 72 hours.

b) Companies proposing oil and/or gas wells are requested to submit a letter of application, together with a site plan where the below noted is applicable:

   (i) the point of drilling is to be 40 meters (130 feet) of a surveyed roadway or road allowance (the specific approval is required of County Council/Municipal Committee), and,

   (ii) an access approach is required off a County road. A review is made to determine the adequacy of site line along the road as well as any potential affects to drainage or other matters.

c) A permit is required to construct a pipeline beneath and/or adjacent to any County road/road allowance. The company should submit a letter of application, together with a minimum of two plans showing the location and crossing profile.

d) Additional information related to reclamation standards and land use are available from the administration office.

12. LETHBRIDGE (County No. 26)

a) The County Land Use Bylaw No. 806 controls all types of development in the area. An application complete with site plan and fees are required for any industrial development. Processing time is roughly three to four weeks.

b) Direct contact and communication with landowners would help alleviate some problems when conducting surveys and geophysical testing. Drilling and reclamation activity require municipal approval as well.

c) The County requires a site plan to be submitted if any new approaches are to be constructed on county roads. This is to make certain that proper culverts are installed.

13. MINBURN (County No. 27) – No reply.

14. NEWELL (County No. 4)

Application for road approaches through Council.
Application for road crossings through Council.
Building setback from roads – 40 m (130 feet) from center of any road.

15. PAINTEARTH (County No. 18)

1. Insofar as the majority of the County is zoned "Agricultural" (A) district according to the Land Use Bylaw 289-79, all industrial developments within same are classified Discretionary Uses. Prior to a notice of decision, as issued by the Municipal Planning Commission, becoming valid, an advertising period of fourteen (14) days is mandatory. Therefore, the developer should make application for development at least fifty four (54) days in advance of commencing construction. In most cases, a condition of approval entails that construction drawings be submitted to the Alberta Labour Building Standard Branch for its approval prior to construction. The developer should therefore ensure that A.L.B.S. approved plans are in his possession prior to construction. The courtesies of common sense and understanding are always appreciated by County residents when exhibited by parties wishing to gain access to private property.
2. Reclamation – The County of Paintearth No. 18 requires that all disrupted land be reclaimed to a standard as close as possible to the original form.
3. Pipeline/Road Allowance Crossings – See attached policy.
4. Pipeline in Road Allowances – The County of Paintearth No. 18 prohibits the placement of any and all pipelines in road allowances (i.e.) parallel to and in the road allowances.
5. Setback from Roads – The County's Land Use Bylaw prohibits the placing or construction of buildings, etc. closer than:
   - 45 m (150 feet) from the centerline of rural roads.
   - 53 m (175 feet) from the centerline of secondary roads.
   - 61 m (200 feet) from the centerline of primary roads.
6. Load limits for vehicles travelling on County roads shall be those set by the axle weight control standards of the Department of Transportation. Operators of all trucks requiring overload permits must apply to the following personnel:
   - Public Works Foreman 882-3131
   - Secretary-Treasurer 882-3211

Pipeline/Road Allowance Crossings

The Council of the County of Paintearth No. 18 recognizes the need for pipelines to cross under road allowances. The County administration is hereby authorized to approve requests to have pipelines cross under road allowances subject to the following regulations. A list of approved pipeline/road allowance crossings shall be provided to Council as information.

Regulations:

1. Developed road allowances shall be crossed using the boring method unless otherwise approved.
2. Undeveloped road allowances may be crossed using the open cut method of crossing.
3. Low pressure plastic pipelines crossing municipal road allowances must be placed at a minimum depth of 1.2 m (4 feet) below the existing ditch bottom. The depth of the pipeline shall be maintained for the entire width of the road allowance or 15 m (50 feet) from the centreline of the road whichever is greater.
4. High pressure steel and aluminum pipelines crossing municipal road allowances must be placed at a minimum depth of 2.4 m (8 feet) below the existing ditch bottom. The depth of the pipeline shall be maintained for the entire width of the road allowance or 15 m (50 feet) from the centreline of the road whichever is greater.

5. Warning signs shall be placed on either side of the road allowance to identify the location of the pipeline. These signs are to be maintained by the owner of the pipelines.
6. The applicant and/or successor must agree in writing to save harmless and keep indemnified the County of Paintearth No. 18 from and against any liability which the County of Paintearth No. 18 may sustain or be liable for, in consequence of having permitted the applicant to cross the road allowance with a pipeline.
7. The applicant and/or successor must agree in writing to relocate the pipeline at their own expense if and when required by the County of Paintearth No. 18 due to road construction.
8. Maintenance of all road crossings shall be at the expense and responsibility of the owner.
9. County officials are to be notified one working day prior to commencing with the pipeline/road allowance crossing.
10. All pipeline/road allowance crossings shall be restored to their original condition or to the satisfaction of the Council.

16. PARKLAND (County No. 31)

To date, this County has not adopted any policies or guidelines with respect to Oil Industry developments. Each proposal is dealt with on its own merits and we attach conditions as deemed necessary to keep the proposals compatible with other land uses in the vicinity. As long as the Industry continues to cooperate with this County, as they have in the past, we will not be initiating specific policies to deal with their installations.

17. PONOKA (County No. 3)

See County of Camrose regulations. Communications with plenty of lead time is of prime importance to examine or review a proposed project.

18. RED DEER (County No. 23)

a. Requirements of the Land Use Bylaw must be met. Regulations of this bylaw should be requested prior to project planning. Development Permit is required for any change in land use.

b. Land Surveys – If conducted by bonafide land surveyor, same is covered under the professional act, The Land Surveyors' Act (RSA). Ratepayers and the County can be quickly angered by sloppy survey work in which marker nails are left in the road to be picked up in tires of citizens. This is an ongoing battle particularly between the County government and surveyors acting for the petro-chemical industry. Indeed, the problem has several times been taken up by the Alberta Association of Municipal Districts and Counties with the pertinent Alberta professional association, without much success.

Even though the Act affords a bonafide surveyor right of access and some right to destroy trees and shelterbelt the surveyor should make advance peace with landowners and, if necessary, produce and explain the provisions of the Act. By doing so the surveyor could eliminate a great deal of chafing between himself and the landowners.

Geophysical – Geophysical (seismic) operations are governed under the provisions of The Geophysical Act and, in this County, the Act is strictly enforced by County police and the Alberta Geophysical Branch – Department of Energy and Natural Resources. This County particularly monitors the requirements of placing tags immediately after drilling ceases and before charges are set. Secondly, the proper filling of shot holes in road allowances is vigorously scrutinized by the County. Blocking of roads by seismic equipment is abhorred especially when citizens are denied free access of public roads thereby.

The County supports landowners who protest the shooting of holes near housing and water wells, both prohibited activities under the Act, and quickly checks out claims that seismic firms have trespassed or have deviated from purchased easements.

Pipelining and Production Drilling – are not, per se, within the jurisdiction of the County to superintend. This is done by the Energy Resources Conservation Board. However, a close liaison is maintained between the County and the ERCB at Red Deer.

Petro-chemical producers wishing to construct pipelines across municipal road allowances (developed and undeveloped) must apply for same and supply charts of the proposed crossings along with data as to size of pipe, casing, depths and methods of crossing. If method is by punch or bore, a road disturbance agreement is not required but if the road is to be excavated then the operator is required to enter into a road disturbance and recovery agreement with the municipality before installation is commenced.

Reclamation – Reclamation in this municipality is governed by The Surface Reclamation Act and two members of the County administration are assigned as members of the local reclamation council who singly act with a member appointed by the Minister of Environment to determine if recovery of a site is satisfactory both in accordance with the Act and regulations and the affected landowner. The County is rarely involved, however, in surface reclamation determinations relative to the construction of pipelines.

Companies wishing to move drilling rigs into the County must sign a "Road Use Agreement" at the municipal office. Trucking companies moving drilling rigs into or out of the County must obtain an overload permit from the Alberta Motor Transport Board and the County prior to a move being made.

c. Access approvals are closely monitored since their location can be hazardous to the motoring public. Permission must be obtained prior to installation in a road allowance. The County requires installation of a culvert, if it is necessary for water shed. The surface of the approach must be gravelled if the well is a producer.

19. SMOKY LAKE (County No. 13)

a) Controls which could delay an industrial project within this County are as follows:

   (i) Land Use Bylaw – location and type of development

   (ii) Road Crossing Agreements for pipelines and access roads

   (iii) Overload permits (trucking)

   (iv) Local road bans – especially during spring thaw

b) Sufficient lead time to prepare local officials as to requirements needed to facilitate the orderly evolvement of any project – communication is the key.

c) Access requirements – the County has specific recommendations based upon safety to motorists, water drainage and positioning to insure less maintenance problems.

20. ST. PAUL (County No. 19)

1. Pipelines

   1.1 All pipelines shall be installed in accordance with regulations under The Pipeline Act, The Rural Gas Act, the Energy Resources Conservation Board. The Canadian Standards Association and as herein described.

   1.2 All pipelines paralleling road allowances, shall not at any point be nearer than 38 m (125 feet) to the boundary of the road allowance, unless otherwise approved.

   1.3 Where a pipeline crosses a road, no vertical or horizontal bends shall be permitted in that portion of the pipeline within the boundaries of the road allowances or within 7.6 m (25 feet) of the boundaries on either side of the road allowance, without being approved.

1.4 The County or Council shall be supplied with a detailed map, plans and drawings for approval of all proposed pipelines and or extensions of revisions thereto, prior to commencement of any construction. These drawings shall show location(s) of proposed road crossing(s). The contractor shall not proceed with any construction until the plans have been duly approved by the County.

2. Road Crossings

2.1 All roads shall be punched from shoulder area to shoulder area unless otherwise approved. Shoulder punching shall take place in the ditch no less than 1.8 m (6 feet) from the road shoulder.

2.2 All roads approved for open cut trenching (see paragraph 2.1 above) shall be well tamped throughout the backfilling operation, adequate amount of crushed gravel shall be spread over affected area.

2.3 Maintenance of all road crossings shall be at the expense and responsibility of the owner.

2.4 The depth of all road crossings shall be 1.1 m (42 inches) below existing ditch bottom, unless road improvements are proposed (see 2.5 below). The depth of road crossings shall be maintained at the same elevation throughout the entire width of the road allowance of proposed road allowance.

2.5 Road crossings under roads which are to be improved, may be required to be installed deeper to prevent damage to the pipe. The depth of these installations shall be determined individually and the expense of the deeper installation shall be borne by the owner.

2.6 All road crossings of secondary, oiled or light surfaced, and other local roads which carry a substantial amount of heavy traffic, shall either be series 160 polyethylene plastic, series 125 incased in series 125 polyethylene plastic, shall be steel or aluminum pipe as approved or other regulations as set down in the latest edition of related CSA codes or the Energy Resources Conservation Board of Alberta. All types of crossings shall extend throughout the entire width of the road allowance.

2.7 All other road crossings of improved roads shall be not less than series 160 polyethylene plastic, or equivalent pipe as determined by the Energy Resources Conservation Board and the latest edition of the related CSA codes. This type of pipe shall extend throughout the entire width of the road allowance.

2.8 On improved and unused allowances, same type and thickness of pipe, and the same method of installation as used off the road (on private lands) may be used to cross, providing a proper road crossing be installed, at the expense of the pipeline owner, should the road be improved at a later date.

2.9 All road crossings shall be as near 90 degrees to the road allowance as possible, and properly marked by warning signs (see 1.3).

2.10 Road crossing shall be installed in a manner which will cause the least inconvenience to the travelling public.

2.11 Where traffic is to be detoured around any area due to work being performed on a pipeline or integral part thereof, a detour shall be provided and adequately maintained, with ample signs, etc. being erected throughout. During the hours of darkness, all warning and detour signs and excavations shall be properly illuminated or according to Energy Resources Conservation Board regulations.

2.12 Open trenches that cross the travelled portion of a road shall not be left unattended unless a detour has been provided.

2.13 Authorized personnel shall mark on a map the method of installing road crossings, type of crossing (steel or plastic) and width of road allowance or proposed road allowance concerned.

2.14 The contractor shall be responsible to maintain all ditch and road excavations for a period of at least 12 months from the date of construction.

2.15 No open excavation shall be closer than 3 m (10 feet) from a bridge, pier or earth retaining structure.

2.16 The backfilling of all trenches in the highway right-of-way of within 6.1 m (20 feet) of a bridge, pier or earth retaining structure shall be undertaken immediately after the installation has been placed and passed any necessary inspection. Backfill material shall be thoroughly tamped and compacted in 150 mm (6 inch) layers with mechanical tampers and the owner of the pipeline will be held responsible for any settling in backfill for a period of one year after the completion of the work.

2.17 If deemed necessary, Council or County may change, or make additions to these regulations.

21. STETTLER (County No. 6)

a) The County's Land Use Bylaw, Road Crossing Regulations, and Local Road Bans could delay an industrial project. Most of this could be taken care of with proper pre-planning.

b) Firms conducting land surveys, geophysical, drilling, pipelining, and land reclamation activities should ensure that they have all the necessary County approvals before any activity takes place. This will ensure there is no delay.

c) The County requires all access approaches to County roads be inspected and approved by County staff.

22. STRATHCONA (County No. 20)

Engineering:

Our approval process is as follows:

Drilling Locations

Locations must conform with the Land Use Bylaw and be approved by the Municipal Planning Commission.

Approaches

Locations must conform with the Land Use Bylaw. Review and approval granted by the County Engineering Department in accordance with the current access policy (design specifications and application form attached).

Pipeline Road Crossings

Requests are reviewed and approved by County Utilities Officer after consultation with the County Transportation Engineer to ensure that there will be no long-term road development conflict. At this time a standardized crossing agreement is being drafted by the Alberta Association of Utilities Officers to try to bring uniformity to pipeline crossings of railways.

Planning and Development:

It was the consensus of the Technical Advisory Committee that a portion of Land Use Bylaw 44-80, administered by this department, and the "Safe Procedures for Pipeline and Utility Crossings" produced by the Edmonton Area Pipeline and Utility Operators Committee be included in the update of the handbook (copies attached).

23. THORHILD (County No. 7)

a) Land Use Bylaw – Administration
   (i) Access Approaches
   (ii) Setbacks and other requirements

b) Utility – Utility Department/Utility Officer
   (i) Location of gas lines

(ii) Road crossing regulations for pipelines

c) Other – Administration

(i) Overload permits

(ii) Local road bans as determined by municipality

24. TWO HILLS (County No. 21)

a. County of Two Hills subdivision approval time span may take as little as one month providing the developer has approval from various departments:

1) Alberta Transportation
2) Department of Environment
3) E.R.C.B.
4) AFLW
5) Provincial Planning
6) Land Titles
7) Consumer & Corporate Affairs

and providing that the residents of the County do not object or stall the proposed development.

b. Industry should always contact landowners, and local municipalities prior to any research, feasibility study or development, thus would result in better status quo.

c. Access is usually as per Alberta Transportation recommendations, or County discretion.

25. VERMILION RIVER (County No. 24)

a. We do not currently have any provision for industrial growth within our County and are presently relying on advance contact from developers in order to establish necessary zoning and planning.

b. We would appreciate hearing, in advance, from any Company proposing to carry out surveys, drilling, geophysical operations or construction of any oil-related project. We would also appreciate the consideration of companies involved in these operations to become aware of local road bans to ensure that damage does not result from their activities. Advance notice would prevent problems created for the County such as access and damage to our road systems.

c. Access is probably the major problem created when well sites are established. Oil companies negotiate lease sites and access with land owners and fail to recognize that access is on to County owned property. If companies would make prior contact with the County, they would be informed that a number of accesses would not be allowed, saving considerable time and expense. The County is in the process of preparing a General Municipal Plan and it is hoped that several policies will be adopted relating to access and the number of approaches that will be allowed.

26. VULCAN (County No. 2)

a) County has some controls which could delay an industrial project within the County:

(i) Land-Use Bylaw
(ii) General Municipal Plan Bylaw
(iii) Area Structure Plan Bylaw
(iv) Road Crossing Policy.

b) Provide information on type of work being done well before actual operation begins.

c) No specific access requirements except on certain secondary roads.

d) Road bans in spring and overload permits required on over-weight vehicles.

27. WARNER (County No. 5)

a. Pipelines

1. All pipelines paralleling road allowances, either improved or unimproved in the County, shall not be nearer than 30 m (100 feet) to the boundary of road allowances at any point, unless otherwise approved.
2. Where pipelines must cross a road, no bends shall be permitted in that portion of the pipeline within the boundaries of the road allowance or within 30 m (100 feet) of the boundaries on either side of the road allowance without being approved.
3. The County shall be supplied with a detailed map, plans and drawings for all proposed pipelines and/or extensions or revisions thereto, prior to any construction. These drawings shall show location(s) of proposed road crossing(s). After completion the County shall be supplied with as built maps.
4. The County shall not be liable for any damage injury or other costs or inconvenience arising from the construction, maintenance, or operation of any pipeline or any integral part thereof within the County.
5. All pipeline rights-of-way shall be restored to their original condition or to the satisfaction of the Council.

b. Road Crossings

1. If deemed necessary, Council and or authorized personnel may inspect proposed or installed crossings at any time with representatives of the pipeline owner or contractor concerned.
2. All roads must be punched from should to shoulder unless otherwise approved. Shoulder punching shall take place in the ditch area no less than 1.8 m (6 feet) from road shoulder unless approved.
3. All roads approved for open cut trenching shall be well tamped throughout the backfilling operation and as much gravel as Council sees fit be spread over area.
    - (i) The above mentioned roads will be the responsibility of the owner for a period of 1 year after date of completion or if the County is forced to make repairs from time to time in this period the owner will be charged accordingly.
    - (ii) Maintenance and expense of all road crossings shall be at the expense of the owner.
4. The depth of all road crossings shall be 1.2 m (4 feet) below bar ditch, unless improvements to the road are proposed in the near future. The depth shall be maintained throughout the entire road allowance and the line shall be free from bends and rises.
    - (i) Road crossings which are to be improved may be required to be installed deeper to prevent damage to pipe. These installation depths shall be determined individually and the expense shall be borne by the owner.
5. All roads crossings of secondary, oiled, or light surfaced and other local roads which carry a substantial amount of heavy traffic (to be determined by Council and or authorized personnel) shall be steel pipe or aluminum, as set down by the CSA code and E.R.C.B.
    - (i) All other road crossings of improved roads shall be not less than series 100 plastic pipe or as set down by CSA or E.R.C.B.
    - (ii) On unimproved road allowances the same type of pipe may be used as field ploughing and may be ploughed in as same, providing a proper installation be made, in case of improvements to the road at the cost of the owner.
    - (iii) All road crossings must be installed as near to 90 degrees as possible.
6. Road crossings shall be installed in a manner so as not to cause inconvenience to the public.
    - (i) Where a detour is necessary, a properly maintained detour must be provided. Signs and warnings must also be put up.
    - (ii) All detours and responsibility are at the cost of the owner.

c. Construction

1. The County will not be responsible for any backfilling or maintenance of rights-of-way. Any debris must be cleaned up immediately, such as plastic wrappers, etc. which may harm appearance of land or cause harm to animals or human life.

28. WETASKIWIN (County No. 10)

The County of Wetaskiwin No. 10 requires that all industrial projects which are involved in the transporting of heavy equipment over the County of Wetaskiwin No. 10 roads place a deposit with the County of Wetaskiwin No. 10. The amount of the deposit varies depending on the number of miles of County of Wetaskiwin No. 10 roads travelled during the transporting of heavy equipment and an estimation of possible damage to the roads. Therefore, the amount of the deposit could be up to $5,000.00 depending on individual circumstances.

The procedures that should be followed by the companies involved in any work in the County of Wetaskiwin No. 10 is that the company contact myself, Garth Bancroft, prior to any undertaking of a project in the County of Wetaskiwin No. 10.

The County of Wetaskiwin No. 10 has a policy for all access requirements and will determine the culvert size and other necessary requirements on an individual basis. The County of Wetaskiwin No. 10 has had in the past numerous problems with companies involved in drilling programs entering the County of Wetaskiwin No. 10 without any prior notification, doing a considerable amount of road damage and leaving without the County of Wetaskiwin No. 10 being aware that they were in the vicinity. This has also happened with various companies involved in activities in the County of Wetaskiwin No. 10. This type of activity is something that we are trying very hard to prevent from reoccuring.

The County of Wetaskiwin No. 10, through the establishment of policies and guidelines, has established a good working relationship with firms involved in industrial projects, geophysical groups, drilling companies and pipeline construction crews. The appointment of one individual to approve plans and inspect construction, to keep records of movement of drilling rigs, etc. has helped considerably.

The cooperation with oil companies, construction companies, etc. has been excellent, and a good working relationship has been established.

29. WHEATLAND (County No. 16) – No reply.

II. MUNICIPAL DISTRICTS

1. ACADIA (MD No. 34)

This Municipal District does not have any controls on an industrial project other than any Government regulations which may apply to a given project. My council has no intention, in the near future, of applying controls on an industrial project. Access to any properties is left with the Land Owners of the property concerned.

2. BONNYVILLE (MD NO. 87)

1. Regulations:

1.1 "Council" means the Council of the Municipality.

1.2 "Road crossing" means any pipe installed across the road to convey gas, oil, water, sewage, etc.

1.3 "Secondary road" means all numbered roads other than primary provincial highways.

1.4 "Oiled or Light Surface roads" means roads which have a light asphalt or oiled surface.

1.5 "Local roads" means all roads other than numbered roads and highways and light surfaces or oiled roads.

1.6 All road allowances shall be considered to be a minimum of 30 m (100 feet) in width.

1.7 "Punched/Bored" means a procedure used to establish passageway through a road bed using either an auger or a pneumatic type of equipment, eliminating the necessity of open cut/trenching.

1.8 "Open Cut/Trenching" means open trenching a passageway through a road surface or other surface, and down to the required depth, as opposed to Punched/Bored.

1.9 "Plough (plow)" means a pull type or self propelled machine which is used in the planting or burying of plastic or aluminum pipe in the ground in a continuous, one step operation.

1.10 "Approved or Otherwise Approved" means written approval by Council or authorized personnel of the Municipality.

1.11 "Pipeline" means any piping system, as set forth in the pipeline act, Chapter 275 of the Alberta Statutes 1970 and Amendments thereto, used in the transmission, gathering and/or distribution of gas, oil, water, sewage, mineral, etc.

1.12 "Owner" means the owner and/or operator of a pipeline or integral parts thereof.

2. Pipelines

2.1 All pipelines shall be installed in accordance with regulations under the Pipeline Act, The Rural Gas Act, The Energy Resources Conservation Board, The Canadian Standards Association and as herein described.

All road allowances shall be considered to be a minimum of 30 m (100 feet) in width.

2.2 All pipelines paralleling road allowances, shall not at any point nearer than 38 m (125 feet) to the boundary of the road allowance, unless otherwise approved. See 1.11.

2.3 Where a pipeline crosses a road, no vertical or horizontal bends shall be permitted in that portion of the pipeline within the boundaries of the road allowances or within 7.6 m (25 feet) of the boundaries on either side of the road allowance, without being approved. See 1.11.

2.4 The Municipality or Council shall be supplied with a detailed map, plans and drawings for approval of all proposed pipelines and/or extensions or revisions thereto, **prior** to commencement of any construction. These drawings shall show location(s) of proposed road crossing(s). The contractor shall not proceed with any construction until the plans have been duly approved by the Municipality.

3. Road Crossings

3.1 All roads shall be punched from shoulder area to shoulder area unless otherwise approved. Shoulder punching shall take place in the ditch no less than 1.8 m (6 feet) from the road shoulder. See 1.11.

3.2 All roads approved for open cut/trenching, see paragraph 3.1 above, shall be well tamped throughout the backfilling operation, adequate amount of **crushed** gravel be spread over affected area.

3.3 Maintenance of all road crossings shall be at the expense and responsibility of the owner.

3.4 The depth of all road crossings shall be 1.1 m (42 inches) below existing ditch bottom, unless road improvements are proposed. See 3.5 below. The depth of road crossings shall be maintained at the same elevation throughout the entire width of the road allowance.

3.5 Road crossings under roads which are to be improved, may be required to be installed deeper to prevent damage to the pipe. The depth of these installations shall be determined individually and the expense of the deeper installation shall be borne by the owner.

3.6 All road crossings of secondary, oiled or light surfaced and other local roads which carry a substantial amount of heavy traffic, shall either be series 160 polyethylene plastic, series 125 incased in series 125 polyethylene plastic, shall be steel or aluminum pipe as approved or other regulations as set down in the latest edition of related CSA codes or the Energy Resources Conservation Board of Alberta. All types of crossings shall extend throughout the entire width of the road allowance.

3.7 All other road crossings of improved roads shall be not less than series 160 polyethylene plastic, or equivalent pipe as determined by the Energy Resources Conservation Board and the latest edition of the related CSA codes. This pipe shall extend throughout the entire width of the road allowance.

3.8 All road crossings shall be as near 90 degrees to the road allowance as possible, and properly marked by warning signs. See 2.2.

3.9 Road crossing shall be installed in a manner which will cause the least inconvenience to the travelling public.

3.10 Where traffic is to be detoured around any area, due to work being performed on a pipeline or integral part thereof, a detour shall be provided and adequately maintained, with ample signs, etc., being erected throughout. During the hours of darkness, all warning and detour signs and excavations shall be properly illuminated or according to Energy Resources Conservation Board regulations.

3.11 Open trenches that cross the travelled portion of a road shall not be left unattended unless a detour has been provided.

3.12 Authorized personnel shall mark on a map the method of installing road crossings, type of crossing (steel or plastic) and width of road allowance or proposed road allowance concerned.

3.13 No open excavation shall be closer than 3 m (ten feet) from a bridge, pier or earth retaining structure.

3.15 The backfilling of all trenches in the highway right-of-way of within twenty feet of a bridge, pier or earth retaining structure shall be undertaken immediately after the installation has been placed and passed any necessary inspection.

3.16 Backfill material shall be thoroughly tamped and compacted in 15 cm (6 inch) layers with mechanical tampers and the owner of the pipeline will be held responsible for any settling in backfill for a period of one year after the completion of the work.

3.17 The owner shall be responsible for any costs of exposing and/or relocating the pipeline necessitated by future roadwork at the crossing site.

3.18 If deemed necessary, Council or Municipality may change, or make additions to these regulations.

3. CARDSTON (MD No. 6)

a. All development is controlled by the Municipal Development Control By-Law, which generally does not present any problems on the development on any industrial project.

b. All activity if planned and advised of in advance should not present any problems.

c. No particular access requirements are in regulations at the present time.

4. CLEARWATER (MD No. 99)

1) Most industrial projects, more especially oilfield related projects, are considered a permitted use in agricultural zoned land, and should not be subjected to delay, provided those that require approval of a Development Application or Permit have made their application prior to commencement of construction.

Pipeline road crossings, access approaches, etc. are normally approved within forty eight hours of receipt of the application.

2) In most cases, no real problems should be encountered providing land owners have prior notification, and good public relations prevail.

3) Access approaches off our district and secondary roads require approval from this office prior to start of construction. The approval states size of culverts required, and if construction involves an undeveloped road allowance, the road surface is required to meet the Municipal District standards.

4) The Municipal District of Clearwater No. 99 has experienced a few problems with seismic groups in the past, however, through co-operation of both parties, this problem has been resolved.

5. CYPRESS (MD No. 1)

1) Controls imposed that could delay an industrial project are as follows:
   a) Land Use Bylaw (Location and type of development)
   b) Road Crossing Regulations (pipelines)
   c) Setbacks from Roads (pipeline, well sites)
   d) Local Road Bans

This can be resolved by providing M.D. with advance notice and details of planned activities.

2) Contact land owners, adjacent land owners and the M.D. prior to the commencement of any petroleum related activity. Land owners should be provided with names, addresses and telephone numbers of contact people in the event they have concerns during any phase of petroleum industry activity.

3) M.D. regulates and controls location and construction of approaches and access roads.

4) Be familiar with Provincial regulations and requirements governing the industry, e.g. drilling tax, reclamation procedures, weight restrictions, etc.

6. FOOTHILLS (MD No. 31) – No reply.

7. KNEEHILL (MD No. 48)

a) Industrial projects are first required to get a development permit and a building permit (total fee $21.00). Maximum time required, two months.

b) Advance notice of work to be done; no undue damage to roads and ditches, etc.; good clean up when jobs are finished; close communication with our office.

c) Access requirements-permission in advance; minimum 183 m (600 feet) sight distance each way if possible; no damage to the existing road or repair of same. Permit required.

d) Road crossing agreement required for pipelines.

e) Overload permits required for trucking on municipal roads, seasonal road restrictions.

8. PEACE (MD No. 135)

Council would appreciate advance notice of any activity in our municipality. This notice would need only be a day or two before any particular activity would take place.

9. PINCHER CREEK (MD No. 9)

The Municipal District of Pincher Creek No. 9 has in effect a development control by-law which requires that permits be obtained for all development except agricultural buildings. Delays in proceeding with construction could be avoided if application for development permits are received at least 30 days prior to the proposed construction date. The present Provincial regulations apply with regard to land surveys, geophysical exploration, drilling and production. There are some variations from the Provincial regulations with regard to pipeline installations. A copy of our policy is attached.

It would be advisable for developers to contact the Municipal District Office with regard to weight limits permitted on Municipal roads to insure that there would be adequate access to the proposed construction site. The maximum weight limits vary with different classifications of roads.

Geophysical operators are required to notify the Municipal District Office of the beginning of operations at least 48 hours before work begins and shall provide the name of the Company, the Party Manager, a map showing the location of the proposed work and address and phone number where the Party Manager may be contacted.

All road crossings shall be made in accordance with the latest requirements of the Pipeline Act of Alberta and the Canadian Standards Association Z-184-1973 Gas Transmission and Distribution Piping System with these exceptions:

a. That they shall not be less than 1.8 m (6 feet) below the travelled surface nor shall they be less than 1.1 m (42 inches) below the ground surface in any other portion of the right-of-way or for a distance of 30 m (100 feet) from the center line of the right-of-way on either side whichever is the greatest distance.

b. All crossings shall be made at a ninety degree angle to the roadway whenever possible and shall be bored or punched unless otherwise approved. Open trenching is permitted in some cases. No open excavation shall be closer than 3.7 m (12 feet) from the edge of the pavement or roadway.

c. All pipelines paralleling roads must be kept back a minimum of 48 m (150 feet) from the right-of-way boundary unless otherwise approved.

d. Heavy wall or cased pipe, conforming to CSA Z-184-1973, shall be used for a total width of right-of-way at all crossings.

e. There shall be no horizontal or vertical bends in the pipe within 30 m (100 feet) of the existing or proposed right-of-way.

f. The bore size for heavy wall pipe shall be no more than one pipe size larger than the installed pipe. If the bore is larger than one pipe size, a pipe of the bore size shall remain to form a cased crossing.

g. Closed boring methods shall be used in non-cohesive soil conditions.

h. No open excavation shall be closer than 3 m (10 feet) from a bridge, pier or earth retaining structure.

i. No material or equipment shall be deposited or stored any closer than 3.7 m (12 feet) from the edge of the roadway and no cleated equipment shall be permitted to operate on paved surfaces.

j. The backfilling of all trenches in the highway right-of-way or within 6.1 m (20 feet) of a bridge, pier or earth retaining structure shall be undertaken immediately after the installation has been placed and passed any necessary inspection. Backfill material shall be thoroughly tamped and compacted in 15 cm (6 inch) layers with mechanical tampers and the owner of the pipeline will be held responsible for any settling in backfill for a period of one year after the completion of work.

k. All reasonable precautions shall be undertaken during construction, with signing and flagmen as required, to protect and safeguard the lives and property of the travelling public and adjacent property owners. At no time will the highway be closed to traffic.

l. Any installations not meeting these requirements and in need of alterations in the future to facilitate widening or improvement of the municipalities' roadways will be done at the expense of the pipeline owner.

m. The Municipal District of Pincher Creek No. 9 also requires that they be notified at least 48 hours before any pipeline construction starts.

10. PROVOST (MD No. 52)

a) Some controls which could delay an industrial project within the municipality are as follows:
   (i) land-use bylaw (location and type of development)
   (ii) road crossing regulations (pipeline)

(iii) overload permits (trucking)

(iv) local road bans (because of conditions due to excess rain, etc.)

In order to avoid project delays due to any of the above regulations and possibly others, I suggest that adequate notice of the proposed operations be given to the Municipality. If this becomes standard procedure, then it gives the Municipality a chance to review the proposal and comment if necessary.

b) Many problems which arise as a result of land survey, geophysical operations, drilling, production, piping and reclamation activities, etc. are due simply to a lack of communication between industry and land owners, adjacent land owners, municipalities, etc.

c) Industry should better inform themselves regarding Provincial regulations and always contact the municipal office, allowing sufficient lead time before the start of a project.

The location of new approaches is a great concern to the Municipality since the improper choice of a location can be very hazardous to motorists, such as site line, and distances from other approaches and crossroads. Permission must always be obtained prior to installation of any approach of structure of any kind within a county road allowance. Depending on the location, the Municipality may require the installation of culverts and gravel, etc. As mentioned previously, many, if not all problems between the industry and land owners, municipalities, etc. can be alleviated by more direct contact and communication.

11. ROCKY VIEW (MD No. 44)

a. The setback requirements of the Municipal District of Rocky View from a registered road allowance is 30 m (100 feet) and on road crossing any above ground structure must be a minimum 30 m (100 feet) from center line of the road.

b. The procedure to follow is contact with the local authority with complete and detailed plans and if non-conforming discussion with the local authority as to steps to be taken to receive acceptance.

c. Road crossings to conform to Alberta Transportation Highway Standards #STD-205.

12. SMOKY RIVER (MD No. 130)

a. Industrial projects have to obtain a development permit and a building permit prior to any work being done. These can be obtained at the Municipal District Office. Time allowed for processing of permits is approximately 60 days.

b. Advise the Municipal District of any work to be done prior to commencement date. Give location of the campsite and locations where the work is to be done. Also give mobile phone number in the event that we have to get in touch with the "superintendant." Any damage done to the roads, ditches, crossings, etc. shall be the responsibility of the Company. Companies should contact the gas co-ops prior to any work for the exact locations of gas transmissions and distribution lines.

c. Access or egress to a secondary road shall not be permitted where it would be:

1. less than 152 m (500 feet) from an existing access or egress on the same side of the road;
2. less than 152 m (500 feet) from a bridge;
3. at a point where the gradient of the road is in excess of three (3) percent when the existing surveyed road has been constructed to secondary road standards and in the case of an existing surveyed road not constructed to secondary road standards, access or egress will be permitted only if construction to secondary road standards is expected within two years and the grade will then be less than three percent.
4. within 152 m (500 feet) of the end of a curve of greater than 2 degrees curvature.

d. All pipeline road crossings shall be 137 cm (54 inches) below bar-ditch and 183 cm (72 inches) below the crown of the road. All crossings must be at a 90 degree angle unless permission is granted by the Municipal Administrator or the Utilities Officer. Heavy wall pipe or casing shall be used for the total width of the road allowance.

13. SPIRIT RIVER (MD No. 133)

In respect to your correspondence of July 15, 1986 please be advised of the following policies that have been established and are being utilized by the Municipal District of Spirit River No. 133. These policies may delay or interfere with the plans of the Industrial Sector if sufficient time is not allowed to administer the terms of these documents.

a) Control Measures
   (i) Land Use By-Law – zoning and development controls
   (ii) General Municipal Plan – subdivision regulations
   (iii) Road Crossing Permits – regulate pipeline road crossings
   (iv) Access & Road Development – regulate access requirements, stipulate terms and specifications required to allow development of undeveloped road allowances, etc.
   (v) Overload Permits
   (vi) Road Bans

Procedures – We strongly recommend the Industrial Sector to contact the Municipal Office well in advance or in the early stages of planning projects. We have found in the past, that projects have been delayed so that administrative procedures can be enacted. These delays, we realize are costly to the Industrial Sector. We strongly stress the importance of contacting the Municipal Office in the early planning stages of proposed projects or developments.

14. STARLAND (MD No. 47)

The Municipal District of Starland No. 47 requires that the following information be submitted to the Municipality in sufficient time to allow for any agreements or regulations to be authorized.

a) (i) Development Permit (Type of Development, Location, etc.)
   (ii) Road Crossing Agreements (Pipeline Specifications, Location, Plans, etc.)
   (iii) Access Approach Agreements (Plans, Location)
   (iv) Over Weight Permits (Phone Administration Office for Verbal Approval)

b) To ensure an amicable presence while conducting land surveys, geophysical drilling, production and reclamation activities industry should contact the Municipality, land owners and ensure that any damages or clean up operations are completed before leaving the work area.

c) If a road allowance is fenced, contact the local municipality for information and approval to enter. The above agreements and regulations can be obtained from the Utilities Officer.

15. STURGEON (MD No. 90)

The Municipal District of Sturgeon would appreciate knowing of all Industrial Development well in advance of the proposed construction date.

1) Approvals for "industrial projects" are processed within the purview of the Planning Act, with the exception of those projects exempt under Section 3 of the Act. Depending on the nature of the project, an Application for Development Permit and/or Building Permit is required by this office.

2) With the exception of pipeline projects and reclamation activities, the activities listed in Point 2 of your letter (re. land surveys, geophysical, drilling and production activities) are exempt from regulation by this municipality. We appreciate being advised of geophysical activities, in order that we can refer area residents to the firm responsible. Reclamation activities may require a Development Permit as outlined above. The following are our requirements for pipeline construction projects:

(a) two sets of plans are required.

(b) all construction must comply with ERCB regulations.

(c) the minimum setback requirement from road allowance boundaries is 15 metres.

(d) road crossings must be buried to a depth of 125 cm in the ditch and under the crown road, and must be bored (no open cutting allowed).

(e) all drainage ditches must be restored to pre-existing condition.

(f) all pipelines installed in government road allowances must be lowered or removed at the applicant's expense in the event of future road construction.

(g) No bends in lines are permitted within 15 metres of the boundary of a government road allowance.

(h) All crossings must cross the road allowance at a 90° angle.

3) Our only specific access requirements relates to projects which involve the creation of additional land titles through the subdivision process. A copy of Policy No. 1510 follows:

All entrances constructed to meet the requirements of Policy 1500 shall be built to the following minimum specifications, unless the Superintendent of Public Works has determined that greater specifications are required because of unusual circumstances:

(a) Culverts shall be a minimum of 10 metres in length and 500 millimetres in diameter, or, equivalent in diameter to the culvert immediately upstream, whichever is the larger.

(b) Sufficient clay cover shall be provided to make the entrance level with the road grade.

(c) Finished width shall be 8 metres.

(d) Eight cubic metres of gravel shall be provided on each entrance.

16. TABER (MD No. 14) – No reply.

17. WAINWRIGHT (MD No. 61)

In answer to Question 1, industrial projects could be delayed if they do not have a minimum of verbal permission to cross our road allowances. Quite often the written agreements are not completed prior to commencement of the work. Also, the municipality insists on a minimum of 40 metres set back of centre line of the road for any permanent development. Rarely this is ever waived. Some companies are still not allowing enough lead time on a proposed development. Sometimes the only notice is a last minute phone call before the application goes to the Board. It takes time to get approvals on well sites as well as approaches and pipeline road crossings.

Question 2, we usually do not have a problem with industry on this.

Question 3, the M.D. of Wainwright request approach approval since our policy is one approach per quarter section. Joint use with landowner is preferable. Quite often approaches are built without consent. Many times the location of the access is situated in an undesirable location. Industry has started to contact our office for approval and specifications.

18. WESTLOCK (MD No. 92)

These regulations shall govern standards and procedures used in the construction, maintenance and operation of pipelines and/or integral parts thereof, or extensions thereto within the Municipal District. Provincial regulations must be followed at all times.

1. Definitions

In these regulations:

1.1 "Council" means the council of the municipal district of Westlock No. 92.

1.2 "Road Crossing" means any pipe installed across a road to convey gas, oil, water, sewage, etc.

1.3 "Secondary Road" means all numbered roads other than primary provincial highways.

1.4 "Oiled or Light Surface Roads" means roads which have a light asphalt or oiled surface.

1.5 "Local Roads" means all roads other than numbered roads and highways and light-surfaced or oiled roads.

1.6 "Unimproved Road Allowances" means road allowances to which no improvements have been made in the way of road construction.

1.7 "Punched/Bored" means a procedure used to establish passageway through a road bed using either an auger or a pneumatic type of equipment, eliminating the necessity of open cut/trenching.

1.8 "Open Cut/Trenching" means open trenching a passageway through a road surface or other surface, and down to the required depth, as opposed to Punched/Bored.

1.9 "Plough (plow)" means a pull type of self-propelled machine which is used in the planting or burying of plastic or aluminum pipe in the ground in a continuous, one-step operation, eliminating trenching and back-filling.

1.10 "Approved or Otherwise Approved" means approval by council and/or authorized personnel of the Municipal District.

1.11 "Pipeline" means any piping system, as set forth in the Pipeline Act Chapter 275 of the Alberta Statutes 1970 and Amendments thereto, used in the transmission, gathering and/or distribution of gas, oil, water, sewage, mineral, etc., either steel or plastic (fiberglass) pipe.

1.12 "Owner" means the owner and/or operator of a pipeline or integral parts thereof.

2. Pipelines

2.1 All pipelines, paralleling road allowances, either improved or unimproved in the Municipal District, shall not at any point be nearer than 30 m (100 feet) to the boundary of the road allowance, unless otherwise approved. (See Paragraph 1.10)

2.2 Where a pipeline crosses a road, no bends shall be permitted in that portion of the pipeline within the boundaries of the road allowance or within 7.6 m (25 feet) of the boundaries on either side of the road allowance, without being approved. (See Paragraph 1.10)

2.3 The Municipal District shall be supplied with a detailed map, plans and drawings for approval of all proposed pipelines and or extensions or revisions thereto, prior to commencement of any construction. These drawings shall show location(s) of proposed road crossing(s).

2.4 The Municipal District shall not be liable for any damage, injury, or other costs or inconvenience arising from the construction, maintenance or operation of any pipeline or integral part thereof within the municipal district.

2.5 All pipeline right-of-ways shall be restored to their original condition, or to the satisfaction of the Council.

3. Road Crossings

3.1 If deemed necessary, Council and or authorized personnel may inspect proposed crossing locations with representative(s) of the pipeline owner or contractor concerned.

3.2 All roads shall be punched from shoulder to shoulder unless otherwise approved. (See Paragraph 1.10)

3.3 All roads approved for open cut/trenching, (see Paragraph 3.2 above), shall be well tamped throughout the backfilling operation, and six 1.6 m^3 (6 $yards^3$) of crushed gravel be spread over affected area.

3.4 Maintenance of all road crossings shall be at the expense and the responsibility of the owner.

3.5 The depth of all road crossings shall be 1.4 m (54 inches) below existing ditch bottom, unless road improvements are proposed. (See Paragraph 3.6 below.) The depth of road crossings shall be maintained at the same elevation throughout the entire width of the road allowance or proposed road allowance.

3.6 Road crossings under roads which are to be improved, may be required to be installed deeper to prevent damage to the pipe. The depth of these installations shall be determined individually and the expense of the deeper installation shall be borne by the owner.

3.7 All road crossings of secondary, oiled or light surfaced and other local roads which carry a substantial amount of heavy traffic (to be determined by the Council and/or authorized personnel) shall either be series 160 polyethylene plastic or equivalent, in a steel case, or shall be steel pipe, as set down in the latest edition of related CSA codes and the Energy Resources Conservation Board of Alberta. Both types of crossings shall extend throughout the entire width of the road allowance.

3.8 All other road crossings of improved roads shall be not less than series 160 polyethylene plastics, or equivalent pipe as determined by the Energy Resources Conservation Board and the latest edition of the related CSA codes. This type of pipe shall extend throughout the entire width of the road allowance.

3.9 On unimproved road allowances, (see paragraph 1.6) the same type and thickness of pipe, and the same method of installation as used off the road (on private lands), may be used to cross, providing a proper road crossing be installed, at the expense of the pipeline owner, should the road be improved at a later date.

3.10 From the fence line where depth of pipe will be 1.4 m (54 inches), pipe may rise at an angle to standard 0.9 m (36 inch) plowing depth, not less than 6.1 m (20 feet) from fence line.

3.11 All road crossings shall be as near 90 degrees to the road allowance as possible, and properly marked by warning signs. (See Paragraph 2.2)

3.12 Road crossings shall be installed in a manner which will cause the least inconvenience to the travelling public.

3.13 Where traffic is to be detoured around any area, due to work being performed on a pipeline or integral part thereof, a detour shall be provided and adequately maintained, with ample signs, etc., being erected throughout. During the hours of darkness, all warning and detour signs and excavations shall be illuminated by flares.

3.14 Open trenches that cross the travelled portion of a road shall not be left unattended unless a detour has been provided.

3.15 Council and/or authorized personnel shall mark on a map, the method of installing road crossings, type of crossing (steel or plastic) and width of road allowance or proposed road allowance concerned.

For further information, refer to the Municipal District's Land Use By-Law No. 8-1979, amended February 1985.

19. WILLOW CREEK (MD No. 26)

These regulations shall govern standards and procedures used in the construction, maintenance and operation of pipelines and/or integral parts thereof, or extensions thereto within the municipality. Provincial regulations must be followed at all times.

1. Definitions

In these regulations:

1.1 "Council" means the Council of the Municipal District of Willow Creek No. 26.

1.2 "Road Crossing" means any pipe installed across a road to convey gas, oil, water, sewage, etc.

1.3 "Secondary Road" means all numbered roads other than primary provincial highways.

1.4 "Oiled or Light Surface Roads" means roads which have a light asphalt or oiled surface.

1.5 "Local Roads" means all roads other than numbered roads and highways and light surfaced or oiled roads.

1.6 "Unimproved Road Allowances" means road allowances to which no improvements have been made in the way of road construction.

1.7 "Punched/Bored" means a procedure used to establish passageway through a road bed using either an auger or a pneumatic type of equipment, eliminating the necessity of open cut/trenching.

1.8 "Open Cut/Trenching" means open trenching a passageway through a road surface or other surface, and down to the required depth, as opposed to Punched/Bored.

1.9 "Plough (plow)" means a pull type or self propelled machine which is used in the planting or burying of plastic or aluminum pipe in the ground in a continuous, one step operation, eliminating trenching and back-filling.

1.10 "Approved or Otherwise Approved" means approval by Council and/or authorized personnel of the Municipal District of Willow Creek No. 26.

1.11 "Pipeline" means any piping system, as set forth in the Pipeline Act Chapter 275 of the Alberta Statutes 1970 and Amendments thereto, used in the transmission, gathering and/or distribution of gas, oil, water, sewage, mineral, etc., either steel or plastic (fiberglass) pipe.

1.12 "Owner" means the owner and/or operator of a pipeline or integral parts thereof.

2. Pipelines

2.1 All pipelines paralleling road allowances, either improved or unimproved in the Municipal District, shall not at any point be nearer than 30 metres to the boundary of the road allowance, unless otherwise approved. (See paragraph 1.10 above.)

2.2 Where a pipeline crosses a road, no bends shall be permitted in that portion of the pipeline within the boundaries of the road allowance or within 35 metres of the boundaries on either side of the road allowance, without being approved. (See paragraph 1.10 above.)

2.3 The Municipal District shall be supplied with a detailed map, plans and drawings for approval of all proposed pipelines and/or extensions or revisions thereto, 30 days prior to commencement of any construction. These drawings shall show location(s) or proposed road crossing(s).

2.4 The Municipal District shall not be liable for any damage, injury, or other costs or inconvenience arising from the construction, maintenance or operation of any pipeline or integral part thereof within the municipality.

2.5 All pipeline right-of-ways shall be restored to their original condition, or to the satisfaction of the Council.

3. Road Crossings

3.1 If deemed necessary, Council and/or authorized personnel may inspect proposed crossing locations with representative(s) of the pipeline owner or contractor concerned.

3.2 All roads shall be punched from shoulder to shoulder unless otherwise approved. (See paragraph 1.10 above.)

3.3 All roads approved for open cut/trenching (see paragraph 3.2 above) shall be well tamped throughout the backfilling operation, and 4.6 m^3 (6 $yards^3$) of crushed gravel be spread over affected area.

3.4 Maintenance of all road crossings shall be at the expense and the responsibility of the owner.

3.5 The depth of all road crossings shall be 1.4 m (54 inches) below existing ditch bottom, unless road improvements are proposed. (See paragraph 3.6 below.) The depth of road crossings shall be maintained at the same elevation throughout the entire width of the road allowance or proposed road allowance.

3.6 Road crossings under roads which are to be improved may be required to be installed deeper to prevent damage to the pipe. The depth of these installations shall be determined individually and the expense of the deeper installation shall be borne by the owner.

3.7 All road crossings of secondary, oiled or light surfaced and other local roads which carry a substantial amount of heavy traffic (to be determined by the Council and/or authorized personnel) shall either be series 160 polyethylene plastic, or equivalent, in a steel case, or shall be steel pipe, as set down in the latest edition of related CSA codes and the Energy Resources Conservation Board of Alberta. Both types of crossings shall extend throughout the entire width of the road allowance.

3.8 All other road crossings of improved roads shall be not less than series 160 polyethylene plastic, or equivalent pipe as determined by the Energy Resources Conservation Board and the latest edition of the related CSA codes. This type of pipe shall extend throughout the entire width of the road allowance.

3.9 On unimproved road allowances (see paragraph 1.6 above) the same type and thickness of pipe, and the same method of installation as used off the road (on private lands), may be used to cross, providing a proper road crossing be installed, at the expense of the pipeline owner, should the road be improved at a later date.

3.10 All road crossings shall be as near 90 degrees to the road allowance as possible, and properly marked by warning signs. (See paragraph 2.2).

3.11 Road crossings shall be installed in a manner which will cause the least inconvenience to the travelling public.

3.12 Where traffic is to be detoured around any area, due to work being performed on a pipeline or integral part thereof, a detour shall be provided and adequately maintained, with ample signs, etc., being erected throughout. During the hours of darkness, all warning and detour signs and excavations shall be illuminated by flares.

3.13 Open trenches that cross the travelled portion of a road shall not be left unattended unless a detour has been provided.

3.14 Council and/or authorized personnel shall mark on a map, the method of installing road crossings, type of crossing (steel or plastic) and width of road allowance or proposed road allowance concerned.

III. IMPROVEMENT DISTRICTS

1. BIG HORN (ID No. 8) – No reply.

2. CALGARY (ID No. 4 & 9) – No reply .

3. CANMORE (ID No. 6)
   a. Development permits and building permits: Application for Development permits should be made early so that Municipal authorities have time to consider them and obtain added information if needed for a decision. This will prevent delays at the construction stage.
   b. Carry out a good public relations program, obtain all necessary permits and permissions, let everyone concerned know what you intend to do and complete reclamation activities promptly on completion of work.
   c. Any work to be done on road allowances in Improvement Districts must be cleared with the District Engineer for Alberta Transportation.
   d. Remember that it is the local Municipal Officials who issue the permits. It is a good idea to discuss major developments with Cabinet Ministers and politicians but applications for permits must be made to local offices.

4. DRUMHELLER (ID No. 7) – No reply .

5. EDSON (ID No. 14)
   a) An approved development permit is required prior to commencement of any facility construction with the I.D. An application form must be accompanied by a site plan and application fee and be submitted to either the Evansburg or Edson office. The approval is not valid until 14 days after the date of issue.
   b) Geophysical exploration requires a written notice of the area to be explored. Drilling, piping and reclamation are under the control of the ERCB, Alberta Environment and Alberta Forestry, Lands & Wildlife.
   c) Alberta Transportation is the road authority and should be contacted for any specific access requirements onto public roadways.

6. FORT MCMURRAY (ID No. 18 North)
   a) This office is responsible for all development within the Improvement District and this is strictly controlled within Land Use Order No. 2 and the Fort McMurray Fringe Area Planning Study.
   b) Any Industrial proposition should be discussed in advance with the Improvement District Office (743-7162) or with the Planning Branch, Lakeland Planning Unit, Edmonton (427-2995).
   c) Road Access should be discussed with Alberta Transportation and Alberta Forestry.

7. FORT VERMILION (ID No. 23)
   a) The Department of Municipal Affairs requires that a development permit be applied for prior to the start of construction of a project. The fee is $25.00 dollars for commercial and industrial use and $10.00 dollars for residential use. There is a fourteen day appeal period from the date the development permit is advertised in a local newspaper. After the fourteen days the permit is a valid development permit in which the applicant has one year to construct.
   b) The Land Use Order for Improvement District No. 23 is in effect as of July 29th, 1981 and any industry wishing to locate on property not zoned correctly will have to make application to have the order amended. The fee is $25.00 dollars.

8. HIGH PRAIRIE (ID No. 17 Central)

   a. This department requires that a Development Permit be applied for prior to the start of construction of a project. There is a 17 day waiting period from the date of permit approval.
   b. A Land Use Order will be in place effective June 1st, 1981 and any industries wishing to locate within the area on property not zoned industrial will have to make application to have the order amended.
   c. Access requirements are part of the conditions set out within the development application.
   d. The establishment of some industries within the area may require that the applicant enter into a Developer's Agreement with this Department.

9. LAC LA BICHE (ID No. 18 & 24)

   a) Environmental concerns, if any, must be satisfied.
   b) Comply with the zoning and other requirements of the new Land Use Order that came into effect on April 27, 1981, for Improvement District No. 18.
   c) A Development Permit is required before any development is implemented in I.D. #18.

   Alberta Transportation has control over all road, access, and approach requirements in Improvement Districts.

10. MEDICINE HAT (ID No. 1)

   a. Well in advance (1 month) of the commencement of construction, a development application must be submitted to our office, along with a $10.00 application fee. The application is presented to our Municipal Planning Commission for their approval. Upon approval a development permit is issued. The permit will be advertised in our local newspaper and is subject to a 14 day appeal period.
   b. Any work to be done on any roads in Improvement District No. 1 must be approved by the District Engineer, Department of Transportation.

11. PEACE RIVER (ID No. 17W)

   a) Industry development must comply with zoning regulations as set forth by the I.D. 17 Land Use Order and the Mackenzie Regional Plan.
   b) Development permits are required by the Improvement District office – such permits require a 17 day waiting period. Highway development control permits must be obtained from Alberta Transportation where projects are undertaken within 30 m (100 feet) of primary and secondary highways. Permission with regards to pipelines crossing road allowances must also be obtained from Alberta Transportation where projects are undertaken within 30 m (100 feet) of primary and secondary highways. Alberta Transportation must be informed prior to the construction of any approach or access.
   c) Approval must be obtained from the I.D. Administration Office before hauling water from Community Water Supplies.

      Uses and problems encountered with Roadways must be brought to the attention of Alberta Transportation.

12. PEACE RIVER (ID No. 21 & 22)

   a. Industry development must comply with zoning regulations as set forth by the Peace River Regional Preliminary Plan (office at Grande Prairie).

b. Development permits are required by the Improvement District office – such permits require a 17 day waiting period. Highway development control permits must be obtained from Alberta Transportation where projects are undertaken within 30 m (100 feet) of primary and secondary highways. Permission with regard to pipelines crossing road allowances must also be obtained from Alberta Transportation where projects are undertaken within 30 m (100 feet) of primary and secondary highways.

c. A business license must be obtained from Alberta Consumer and Corporate Affairs. Specific information regarding fees, etc. can be obtained from that department.

d. There are no specific access requirements. Approval must be obtained from the I.D. Administration Office before hauling water from Community Water Supplies. Uses and problems encountered with Roadways must be brought to the attention of Alberta Transportation.

13. SLAVE LAKE (ID No. 17 (E))

a. In Improvement Districts we exercise the same control as other rural municipalities in as much as development permits are required.

b. Typical procedures as other municipalities pursuant to The Planning Act, Subdivision and Transfer Regulations, and The Oil and Gas Conservation Act.

c. Access is at the expense of the developer to a standard acceptable to the office of the District Engineer.

d. Some concern has been expressed lately, and this appears in the minutes of some council meetings, where damage to rural roads has caused some inconvenience to ratepayers. There has also been some discussion concerning responsibility of the major developers wherein said developers disclaim any responsibility for the actions of their subcontractors. These actions include gating in some cases of public roads, and actual trespass and damage to private property. It appears that the major developers are not greatly concerned over the actions of their contractors and it seems only reasonable to rural people that the developers should ensure that when a contract is let, some direction be included to the effect that these people be required to obey the same laws as anyone else.

14. SPIRIT RIVER (ID of Birch Hills – ID No. 20)

a) The Improvement Districts recently adopted the Land Use Orders. This Document is designed to control development within the Improvement District. The I.D.'s have not zoned any areas for rural industrial projects. Prior to any development permits being issued proper zoning would be required. This would be accomplished through an amendment to the Order. We are also required to adhere to a Regional Plan when considering industrial development.

b) When conducting land surveys, etc., we suggest that you obtain all necessary permits and easements and inform our office two weeks prior to expected starting date, and again 48 hours before start time. Good public relations and good reclamation procedures save us all a lot of trouble.

c) All access specifications are available from the Department of Transportation, the I.D. road authority.

d) We would also appreciate any documentation that could be given to us showing that Environmental and any other standards are met by the proposed industrial project.

e) Prior to entering property owned by the Department of Municipal Affairs (e.g. water reservoirs, sewage lagoons) permission must be obtained through our office.

15. VALLEYVIEW (ID No. 16) – No reply.

16. WHITECOURT (ID No. 15) – No reply.

17. BOW/CROW FOREST (ID No. 5)

Improvement District #5 also covers Kananaskis Country in which the Alberta Forest Service are the land managers with the exception of Bow Valley Provincial Park, Peter Lougheed Provincial Park and a few specific recreational areas gazetted to the Recreation Program Branch. Through a referral process the Alberta Forestry Service is responsible for co-ordinating the concerns of all agencies such as: Fish & Wildlife, Recreation Program Branch and the Kananaskis Country Interdepartmental Committee.

Any installation or facility within Kananaskis Country must be of a very high standard. Not only does a structure have to meet Kananaskis Country building standards but it must also match the colour motif for Kananaskis Country.

As Kananaskis Country is highly orientated towards Recreation Uses, the visual impact of any installation is given a very high priority. Watershed values and aesthetics are of the highest order for this area.

APPENDIX B
MAPS

Appendix B

TABLE OF CONTENTS

APPENDIX B MAPS AND DIRECTORIES FOR ENVIRONMENTAL PARAMETERS

- B.1 General Information

- B.2 Biophysical Data
  - B.2.1 Topography, Landforms and Surficial Materials
  - B.2.2 Soils
  - B.2.3 Vegetation
  - B.2.4 Climate, Meteorology and Air Monitoring Requirements

- B.3 Land Reserves
  - B.3.1 Agriculture
  - B.3.2 Forest Vegetation
  - B.3.3 Grazing
  - B.3.4 Archaeological Resources and Historic Sites
  - B.3.5 Recreation, Provincial and National Parks
  - B.3.6 Wildlife
  - B.3.7 Mineral Resources and Petroleum Industry

- B.4 Water Resources
  - B.4.1 Surface Water Resources
  - B.4.2 Aquifers and Groundwater Resources
  - B.4.3 Water Quality
  - B.4.4 Fisheries and Aquatic Environment

- B.5 Existing Infrastructure and Related Facilities
  - B.5.1 Roads, Trails, Cutlines and Traplines in Alberta
  - B.5.2 Pipelines and Transmission Lines
  - B.5.3 Irrigation Canals and Drainage Ditches
  - B.5.4 Airstrips, Water Landing Facilities, Heliports

- B.6 Environmentally Unique and Protected Areas
  - B.6.1 Natural Areas and Ecological Reserves
  - B.6.2 Endangered Species and Critical Habitats

APPENDIX B MAPS AND DIRECTORIES FOR ENVIRONMENTAL PARAMETERS

The intent of this appendix is to provide the user with a listing of available maps and directories that will assist the user in defining environmental parameters for a particular project in a specific location.

B.1 GENERAL INFORMATION

The following are recommended as good general reference sources pertaining to environmental conditions within the province of Alberta:

1. **Natural Resources Information Directory**

Information: This particular document is extremely important and useful for the petroleum industry. The document provides information on all of the agencies which supply information to the directory such as Advanced Education, Agriculture, Attorney General, Culture, Forestry Lands and Wildlife, Alberta Energy, Environment, ERCB, AOSTRA, Petroleum Marketing Commission and Research Council. It also includes listings of all resource information libraries, research stations and information centres.

All pertinent resource related legislative statutes are listed.

All resource related maps produced by the Province of Alberta are also identified. This includes maps for aggregate inventory, agroclimatic zones, cadastral base series, planimetric urban map series, planimetric and forest cover, topographic series, forest cover series, topographic forest reserves, ground control survey series, access series, thematic (various themes) resource maps, bathymetric survey series, bedrock geology, coal disposition, ecological land classification, fish resources, forest inventory series (scales 1:50000, 1:30000 and 1:15000), geographical series, hydrogeology, soil capability for agriculture, land capability for forestry, furbearers, outdoor recreation, sport fish ungulates, waterfowl, coal exploration, ecological and physical land classification, municipalities national topographic system (NTS), oil and gas, oil sands, precipitation, provincial parks, soil surveys, geomorphic landforms, surficial geology, vegetation, wildlife mapping and more.

A number of resource reports are also listed, such as inventory reports for surficial aggregates, atmospheric sciences, earth sciences, Alberta roads, big game reports, biophysical river valley reports, historical and archaeological resources, environmental effects of various topics (e.g. sulphur extraction, forestry, surface mining), flood control, geological survey of Canada, groundwater reports, habitat, Kananaskis Country, recreation lake studies, landuse in the Eastern Slopes, hazardous wastes, fisheries management, meteorological, municipal planning, northern water supply, noise, forest inventory reports, pollution in rivers, regional and rural planning, river basin and river channel studies, river valley resources, soil irrigation, the use of pesticides and herbicides, water resource development studies and more.

Finally the document provides a listing of resource and data base files on aerial photography, forest inventories, archaeological sites, bentonites and limestones, climate, crop reports, lakes and stream information inventory, lake water quality, river water quality, seismic statistics, snow data, soil data, timber production, vegetation, water wells and weather.

Available: Information Centre, AFLW

phone: 427-3590.

2. **Maps Alberta Catalogue 1986-87**

Information: The catalogue is a list of Provincially published and Federally published maps available through Maps Alberta of the Bureau of Surveying and Mapping. Maps available include resource maps, political boundary maps, public lands maps, reserve lands, topographical maps, urban maps, geological survey maps, hydrographic maps and aeronautical maps.

Available: Maps Alberta, Alberta Forestry, Lands and Wildlife
phone: 427-3520.

3. **Canada Land Inventory and Alberta Land Inventory Maps**

Information: CLI maps indicate land capability and use for agriculture, forestry, recreation, ungulates and waterfowl.
ALI maps cover areas for which CLI maps are not available;
scale 1:250000/1:1000000/1:50000.

Available: Maps Alberta, or Bureau of Surveying and Mapping
phone: 427-3520.

4. **Biophysical Analysis and Evaluation of Capability Reports**
(Land Classification Studies – Ecological)

Information: These reports provide baseline information on landforms, soils, climate, vegetation and drainage. Potential land use capabilities are provided for Agriculture, Forestry, Recreation and Wildlife.

Available: Resource Evaluation and Planning, AFLW
phone: 427-9017.

5. **Aerial Photographs, Ground and Air Reconnaissance**

Information: Photographs provide information for the planning and evaluation of sites, identification of surface characteristics, vegetation, soils, alignments and proposed corridors.

Available: Aerial Photo Distribution Centre, AFLW
phone: 427-3519.

6. **The Resource Handbook Operational Guidelines for Industry**

Information: Includes guidelines and standards for the petroleum industry. The handbook recognizes the need for the petroleum industry and the forest service to work together under mutually-acceptable standards. Topics include specific operating guidelines as they relate to exploration, development and reclamation.

Available: Information Centre, AFLW
phone: 427-3590.

7. **Publications List, Alberta Research Council 1986**

Information: The booklet outlines the publications available from the Alberta Research Council. Publications include: bulletins, reports, information series and maps. Topics include: atmospheric, natural resources, exploration, hydrology, geology and general earth sciences.

Available: Publication Sales, Alberta Research Council
phone: 450-5111.

8. **ERCB Publications, Maps and Services Catalogue**

Information: This booklet is a listing of information services available through the ERCB. Topics available include Acts and regulations, ERCB reports, non-ERCB reports, pipeline maps, natural resource maps, and electricity maps. ERCB also provides such services as computer services and research services.

Available: Energy Resources Conservation Board
phone: 297-8311.

B.2 BIOPHYSICAL DATA

B.2.1 TOPOGRAPHY, LANDFORMS AND SURFICIAL MATERIALS

Information available regarding topography, landforms and surficial materials are as follows:
(Note: All information is distributed by Maps Alberta, AFLW, phone: 427-3520 unless otherwise noted)

1. **Provincial Base Map with topographical features**

   Scale: 1:500000

   Information: 1000 ft. contour tints up to 4000 ft. elevation above sea level. Shows hydrography, access, cities, towns, villages, Indian Reserves, Metis settlements, provincial parks, natural parks and Department of National Defence.

2. **Forest Reserve (Topographical Maps)**

   Scale: 1:200000

   Information: Maps show roads, topography, cutlines, mines, lookout towers, ranger cabins, stations and Alberta Forest Service recreation areas for the Clearwater, Bow and Crowsnest forest reserves.

3. **Alberta Topographical Series**

   Scale: 1:100000

   Information: 50 ft. contour intervals, pipelines, transmission lines, builtup areas, houses, schools, churches, Indian Reserves, parks, recreation areas, detailed hydrology and access.

4. **Bedrock Topography Maps**

   Scale: varies

   Information: Surface and bedrock topography and drift thickness.

5. **Bedrock Geology**

   Scale: 1:1267000

   Information: Alberta Research Council maps on rock formation at or near surface.

6. **Bedrock Topography**

   Scale: varies

   Information: Surface and bedrock topography for southern and central Alberta.

7. **Integrated Resource Inventories**

   Scale: varies

   Information: Describes physical land, soils and vegetation of the landscape and their interrelationships.

8. **Surficial Geology Maps**

   Scale: 1:1000000

   Information: Shows township survey lines, provincial and national parks, Indian Reserves, cities, towns, villages and unincorporated communities, airfields, railways, primary, secondary and other roads, trails, hydrographic features, hypsometric tints, contours and spot elevations.

9. **National Topographic Series (NTS) Code 402**

   Scale: 1:500000

   Information: Shows provincial and national parks, cities, towns, villages, roads, hydrographic features, hypsometric tints, contour and spot elevations. Designed especially for use as a base map for aeronautical charts.

10. **National Topographic Series (NTS) Code 403**

Scale: 1:250000

Information: Detailed relief with contour and spot elevations, hydrography, wooded areas, populated centres and communities, access, railways and airfields. Complete topographical information at medium scale.

11. **National Topographic Series (NTS) Code 404**

Scale: 1:150000

Information: Detailed relief with contours (50 feet and larger) and spot elevations, benchmarks, horizontal control points, all surveyed lines, cities, towns, villages and unincorporated communities, hydrographic features, primary and secondary access roads, railways, ferries and other pertinent data.

12. **National Topographic series (NTS) Code 406**

Scale: 1:25000

Information: Detailed relief with contours (10 ft. intervals) and spot elevations, benchmarks, horizontal control points, cities, towns and unincorporated communities, major buildings, shopping centres, golf courses, cemeteries, sport tracks, hydrographic features, wooded areas, gravel pits, transmission lines and towers.

13. **Surficial Geology and Erosion Potential, Foothills of Alberta**

Scale: 1:50000 to 1:250000

Information: Maps outline and describe surficial deposits of the Alberta Rocky Mountains and Foothills. Deposits are categorized according to degree of stability and slope steepness by percentage. Landscape is classified for erosion potential.

Available: Alberta Research Council
phone: 450-5111.

14. **Aggregate Inventory Maps and Reports**

Scale: 1:50000 and 1:250000

Information: Maps illustrate the distribution of major gravel occurrences in the province.

Available: Alberta Research Council
phone: 450-5111.

15. **Surficial Geology Mapping – Oil Sands**

Information: Series of surficial geology maps on bedrock overburden.

B.2.2 SOILS

Information available includes:

1. **Alberta Soil Survey Maps and Reports**

Scale: 1:700000 or 1:760000

Information: Shows major soil groups in Alberta and provides soil surveys.

Available: Alberta Research Council
phone: 450-5111.

2. **Canada Land Inventory Maps, Soil Capability for Agriculture Series**

Scale: 1:250000

Information: Maps indicate the major soil groups found throughout the province and their capability to support various types of agriculture.

Available: Alberta Bureau of Surveying and Mapping, Maps Alberta, AFLW
phone: 427-3520.

3. **Soil Surveys of Urban Areas, Areas Adjacent to Urban Centres, National and Provincial Parks and Areas Assessed for Parks Development.**

   Scale: varies

   Information: Major soil groups distributed throughout parks and urban areas.

   Available: Alberta Research Council
   phone: 450-5111.
   Listed in Natural Resources Information Directory, AFLW, 1985. Report No. Ref. 7-84

4. **Soil Profiles**

   Information: Photographs of typical Alberta soil profiles are available. Each profile includes an explanation of the type of soil with regards to the Canadian System of Soil Classification and distinguishing features, definitions of the abbreviations used, potential use and associated natural cover.

   Available: The complete series of 24 profiles is available from The University of Alberta, Faculty of Extension
   phone: 432-3029.

B.2.3 VEGETATION

Information available includes:

1. **Canada Land Inventory Maps, Land Capability for Forestry**

   Information: Indicates capability ratings for forest productivity based upon the land's inherent ability of mineral or organic soils to grow timber in commercial quantities.

   Available: Alberta Bureau of Surveying and Mapping, Maps Alberta
   phone: 427-3520.

2. **Ecological Land Classification and Evaluation Reports**

   Information: Contains environmental baseline information (landforms, soils, climate, vegetation and drainage) for selected study areas in Alberta.

   Available: Resource Evaluation and Planning Division, AFLW
   phone: 427-7222.

3. **A Checklist of Rare Vascular Plants of Alberta**

   Information: This paper includes a list of all higher flowering plants and ferns that are found in fewer than five areas in Alberta.

   Available: Alberta Culture, Provincial Museum, Edmonton
   phone: 427-1730.

4. **Vegetation Mapping – Oil Sands**

   Information: Series of vegetation maps on the oil sands.

   Available: Maps Alberta
   phone: 427-3520.

B.2.4 CLIMATE, METEOROLOGY AND AIR MONITORING REQUIREMENTS

The Atmospheric Environment Service of Environment Canada and the Alberta Forest Service operate a network of weather observation stations. While some network stations record only daily precipitation, most record both daily temperature and precipitation. Principal stations record sky conditons, visibility, atmospheric pressure, ambient and dewpoint temperature and wind measurements every hour. Long term averages can be obtained for most stations from Atmospheric Environment Services Forecasts. Forecasts can be obtained from the Alberta weather centres. The principal stations are as follows:

Banff – 762-2088
Calgary – 275-2760
Coronation – 578-3545
Edmonton – 468-7931
Edson – 723-4070
Fort McMurray – 743-2698
Fort Nelson – 774-6461
Fort St. John – 785-4304
Grande Prairie – 1-800-422-9201

Jasper – 852-3185 Lethbridge – 327-4334 Pincher Creek – 627-3733
Rocky Mountain House – 845-3183 Slave Lake – 849-3046.

Additional information is included in:
(Note: all documents are available from Atmospheric Environment Services, Environment Canada, phone: 420-3143 unless otherwise noted)

1. **Selected Publications in Climate and Applied Meteorology, January 1985. Ref. No. DS #1-85**
   Information: Source of information reports.
2. **Publications on Climate**
   Information: Nine volumes on radiation, temperature, precipitation, degree days, wind, frost, sunshine, atmospheric pressure, temperature and humidity, soil temperature and lake evaporation.
3. **Principal Station Data**
   Information: The publication "Principal Station Data" which is a summary of hourly weather observations, climate normals and extremes for Canadian Principal Climate Stations is now available for a number of locations within the Province. A list of completed publications is available upon request.
4. **Canadian Climate Normals, 1951-1986**
   Temperature and Precipitation
   Information: Each publication gives temperature and precipitation data for one geographic region of Canada. These publications are products of the Canadian Climate Program.
5. **Precipitation over Alberta**
   Information: Detailed analysis and summary of annual May to September precipitation over Alberta.
   Available: Alberta Forest Service
   phone: 427-6810.

B.3 LAND RESERVES

B.3.1 AGRICULTURE

Information available includes:

1. **Canada Land Inventory Maps, Land (Soil) Capability for Agriculture**
   Scale: 1:50000; 1:63360; 1:250000; 1:1000000
   Information: Soil capability maps based upon potential for agricultural land use.
   Available: Alberta Bureau of Surveying and Mapping, Maps Alberta, AFLW
   phone: 427-3520.
2. **Alberta Soils Course 1976**
   Information: Detailed manual on soils.
   Available: Farm Business Management Branch, Alberta Agriculture,
   phone: 556-1238.
3. **Dryland Saline Seepage Control, 1986**
   Information: Explains the nature and mechanism of the problem and the controls available.
   Available: Publications, Alberta Agriculture
   phone: 427-0391.

4. **Solonetzic Soils Technology and Management, 1978**
Bulletin B-78-1

Information: Document outlines soils formed under grass or grass-forest vegetation cover and information on recent technology and the management of these soils.

Available: Department of Extension, University of Alberta
phone: 432-3116.

5. **Maps and Figures Depicting Agro-Climate Zones of Alberta for Cropping Purposes**

Available: Agriculture Secretary, Faculty of Extension, University of Alberta
phone: 432-3029.

6. **Land (Soil) Capability for Agriculture**

Information: Soil classified into 7 classes for agricultural capability.

Available: Maps Alberta
phone: 427-3520.

B.3.2 FOREST VEGETATION

The information available includes:

1. **Forest Classification**

Information: Three phases of forest inventory. Phase 1: 1948-54; Phase 2: 1956-66 and Phase 3: 1984-86. These maps depict heights of various tree types, densities, age and site quality. Scale varies for each phase. Phase 1 – 1:63360, Phase 2 – 1:31680 and Phase 3 – 1:15000.

Available: Alberta Bureau of Surveying and Mapping, Maps Alberta, AFLW
phone: 427-3520.

2. **Land Capability for Forestry**

Information: Capability ratings for forest productivity.

Available: Alberta Bureau of Surveying and Mapping, Maps Alberta
phone: 427-3520.

3. **Alberta Forest Service Base Map**

Information: Detailed access information in forested areas, cities, towns, villages, settlements, Indian Reserves, Metis colonies, forest reserves, National and Provincial Parks.

Available: Alberta Bureau of Surveying and Mapping, Maps Alberta, AFLW
phone: 427-3520.

4. **Forest Cover Maps**

Scale: 1:100000

Information: Density, height and species of tree stands, trails, seismic lines, access roads, towns, villages, topographic survey bench marks, hydrography.

Available: Maps Alberta, AFLW
phone: 427-3520.

5. **Forest Protection Areas Maps**

Scale: 1:1500000

Information: Areas for which the Alberta Forest Service is responsible for fighting forest fires, and forest fire control zones.

Available: Maps Alberta, AFLW
phone: 427-3520.

6. **Forest Management Unit Map**

Scale:	1:1000000
Information:	Overprinted in two colours on the Alberta Forest Service base map and includes forest management unit boundaries.
Available:	Maps Alberta, AFLW phone: 427-3520.

7. **Forest Ranger District Map**

Scale:	1:1000000
Information:	Overprinted in one colour on the Alberta Forest Service base map and includes Forest Ranger administrative boundaries.
Available:	Maps Alberta, AFLW phone: 427-3520.

8. **Provincial Record (Forest Cover Maps)**

Scale:	1:100000
Information:	Map sheets are revised as information becomes available. Density, height and species of tree stands, detailed access, oil and gas fields, pipelines, transmission lines, seismic lines, ranger stations, airstrips, recreation areas, parks, Indian Reserves, Metis colonies, survey and detailed hydrography.
Available:	Maps Alberta, AFLW phone: 427-3520.

B.3.3 GRAZING

Grazing reserves are community pastures financed, developed and operated by the Public Lands Division, Alberta Forestry, Lands and Wildlife.

Information and maps on natural and ecological areas are available from:

Land Management and Development Branch, AFLW
phone: 427-5209.

B.3.4 ARCHAEOLOGICAL RESOURCES AND HISTORIC SITES

The Alberta Historical Resources Act stipulates that a Historical Resource Impact Assessment must be conducted in conjunction with development projects which are anticipated to cause surface disturbances. Projects of concern include the following kinds of surface disturbances:

1. Linear distrubances including highways, roads, transmission lines and pipelines
2. Extractive disturbances including coal mining, oil sands mining, sand and gravel mining, quarrying, and land filling
3. Impoundment disturbances including dams, reservoirs, and tailing ponds
4. Intensive land use disturbances including industrial, residential, commercial, recreational and agricultural siting, and land reclamation work.

The following information is available:

1. **Interim Guidelines – Historical Resources Impact Assessments**

Information:	Provides guidelines for the conduct of Historical Resources Impact Assessment projects.
Available:	Archaeological Survey of Alberta, Alberta Culture phone: 427-2355.

2. **Policy Statement: Historical Resources Conservation Work Conducted on Projects with a Winter Construction Schedule**

   Information: Advises companies on major developments during the winter.

   Available: Alberta Culture
   phone: 427-4928.

3. **Maps and Figures**

   Information: Depicting archaeological and historical sites.

   Available: Archaeological Survey of Alberta, Alberta Culture
   phone: 427-2355.

B.3.5 RECREATION, PROVINCIAL OR NATIONAL PARKS

Information available includes:

1. **For information on industry exploration as it relates to Provincial Parks contact:**
   Alberta Recreation and Parks, phone: 427-8758.
2. **For information on industry exploration as it relates to National Parks contact:**
   Mailing address: Director General, P.O. Box 2989, Station "M", Calgary
   or
   Office location: Director General, 520, 220 – 4th Ave. S.E., Calgary, T2P 3H8, phone: 292-4444.

B.3.6 WILDLIFE

Information available on wildlife includes:

1. **Canada Land Inventory Maps and Alberta Land Inventory Maps**

   Scale: 1:50000; 1:63360; 1:250000; 1:1000,000

   Information: Maps divided on the basis of physiographic characteristics important to wildlife.

   Available: Alberta Bureau of Surveying and Mapping, Maps Alberta, AFLW
   phone: 427-3520.

2. **Wildlife Key Area Maps**

   Scale: 1:50000; 1:250000; 1:000000

   Information: Maps indicate known winter ranges for ungulates, and production, staging, moulting and nesting sites for waterfowl.

   Available: Habitat Assessment Branch, AFLW
   phone: 427-6734.

3. **Occasional Papers (Wildlife) Series**

   Information: A series of papers examining the relationships between hunters, wildlife and the environment.

   Available: Library, AFLW
   phone: 427-7425.

4. **Land Capability of Furbearers, Ungulates and Waterfowl**

   Scale: 1:250000

   Information: Land units are evaluated on present capability to support wildlife.

   Available: Maps Alberta
   phone: 427-3520.

B.3.7 MINERAL RESOURCES AND PETROLEUM INDUSTRY

Information available on mineral resources and the petroleum industry includes:

1. **Geological and Coal Maps**

   Scale: 1:750000; 1:2500000

   Information: Potential coal development areas, major coal-bearing formations, geologic formations.

   Available: Maps and Publications, ERCB
   phone: 297-8328.

2. **ERCB information and guidelines on Mineral Resources**

   Information: Several documents outlining guidelines as they pertain to the petroleum industry and the exploration of mineral resources.

   Available: Maps and Publications, ERCB
   phone: 297-8328.

3. **Aggregate Inventory Maps and Reports**

   Information: Depicts the distribution of major gravel deposits and occurrences in Alberta.

   Available: Publication Sales, Alberta Research Council
   phone: 450-4117.

4. **Aggregate Resource Maps**

   Information: Location of major gravel deposits and occurrences in Alberta.

   Available: Alberta Bureau of Surveying and Mapping, Maps Alberta
   phone: 427-3520

5. **Maps depicting designated oil and gas fields**

   Available: Alberta Bureau of Surveying and Mapping, Maps Alberta
   phone: 427-3520.

B.4 WATER RESOURCES

B.4.1 SURFACE WATER RESOURCES

Information available on surface water resources includes:

1. **Information on Major Rivers in Alberta**

   Information: Longitudinal river profiles, bridge sites, topographic grid maps, discharge measurements.

   Available: Hydrotechnical Section, Civil Engineering Department, Alberta Research Council, Edmonton
   phone: 438-0555.

2. **Water Survey of Canada**

   Information: Includes daily discharge and sediment loading for major rivers.

   Available: Technical Services Division, Alberta Environment
   phone: 427-6280.

3. **Site Specific Reports and Studies**

   Information: Flood plain studies, suspended sediment data, ice jam reports, engineering reports, site cross-sections.

   Available: Technical Services Division, Alberta Environment
   phone: 427-6280.

4. **River Basin Studies**

Information: The studies establish practices of water resource development control and protection of a particular river basin.

Available: Planning Division, Alberta Environment
phone: 427-2375.

5. **Flood Plain Studies**

Information: Historical flooding, hydrology and flood plain analysis.

Available: Technical Services Division, Alberta Environment
phone: 427-6277.

6. **Stream Flow and Water Quality Data**

Information: Stream flow charts and figures, and water quality assessments on water bodies in Alberta.

Available: Watershed Management Section, Forest Land Use Branch, AFLW, and Technical Services Division, Alberta Environment
phone: 427-6277

7. **Maps Indicating Major Rivers and Lakes in Alberta**

Available: Technical Services Division, Alberta Environment
phone: 427-6277.

B.4.2 AQUIFERS AND GROUNDWATER RESOURCES

The information available on aquifers and groundwater resources includes:

1. **Groundwater Resources**

Available: Groundwater Resources Information Service, Alberta Environment
phone: 427-2770.

2. **Hydrogeological Maps and Hydrogeological Reconnaissance Maps**

Scale: 1:250000

Information: Location of aquifers, estimated yield, water chemistry and groundwater probability are identified.

Available: Publication Sales, Alberta Research Council
phone: 450-5111.

3. **East Central Alberta Regional Groundwater Resource Inventory**

Information: Wells drilled by industry or drillers in east central Alberta and cross-sections of fresh water aquifers.

Available: Groundwater Resources Information Service, Alberta Environment
phone: 427-2770.

B.4.3 WATER QUALITY

Information available on water quality includes:

1. **Federal and Provincial Effluent Standards**

Information: Outlines standards for waste water in Alberta.

Available: Pollution Control Division, Alberta Environment
phone: 427-6270.

2. **Surface Water Data Base**

Information: Water data for various water bodies in Alberta.

Available: Records Centre, Technical Services Division, Alberta Environment
phone: 427-6298.

3. **River Water Quality Data Base**
   Information: Chemical and biological characteristics of major Alberta rivers.
   Available: Water Quality Control Branch, Alberta Environment
   phone: 427-5829.

B.4.4 FISHERIES AND AQUATIC ENVIRONMENT

Information available on Fisheries and Aquatic Environment includes:

1. **Fish Resource Maps**
   Scale: 1:50000; 1:250000
   Information: Location of fish species, life histories and important water bodies.
   Available: Regional Fish and Wildlife Offices, AFLW
   phone: 427-9506.
2. **Fisheries Habitat Protection Guidelines**
   Information: Guidelines for the protection of fisheries as they relate to the petroleum industry.
   Available: Fish and Wildlife Division, AFLW
   phone: 427-6734.
3. **Lake and Stream Manual Files**
   Information: Information on fish species, population statistics, water quality, physical and chemical properties.
   Available: Fisheries Management Branch, AFLW
   phone: 427-6730.
4. **AFLW Series**
   Information:
   - Fisheries Survey Reports
   - Fisheries Research Reports
   - Fisheries Management Reports
   - Fisheries Pollution Reports
   - Fisheries Habitat Development Reports

   Available: Fisheries Management Branch, AFLW
   phone: 427-6730.

B.5 EXISTING INFRASTRUCTURE AND RELATED FACILITIES

B.5.1 ROADS, TRAILS, CUTLINES AND TRAPLINES IN ALBERTA

1. **Provincial Access Series**
   Scale: 1:250000
   Information: Legal survey, primary and secondary roads, airstrips, transmission lines, pipelines, parks, Indian settlements, towns, cities, villages.
   Available: Alberta Bureau of Surveying and Mapping, Maps Alberta, AFLW
   phone: 427-3520.
2. **Forest Cover Series**
   Scale: various scales
   Information: Density, height and species of treestands, trails and seismic lines.
   Available: Alberta Bureau of Surveying and Mapping, Maps Alberta, AFLW
   phone: 427-3520.

3. **Resource Base Series**

   Scale: 1:50000

   Information: Density, height and species of tree stands, trail and seismic lines, oil, gas and forest industry-related details.

   Available: Alberta Bureau of Surveying and Mapping, Maps Alberta, AFLW
   phone: 427-3520.

4. **Trapline Information**

   Available: Administrative Services, AFLW
   phone: 427-6729.

5. **Maps and Figures Depicting Primary and Secondary Highways and Roads and Railways.**

   Available: Alberta Transportation
   phone: 427-7674.

B.5.2 PIPELINES AND TRANSMISSION LINES

Detailed maps depicting pipelines in Alberta are available at:
Pipeline Department, ERCB, phone: 297-8133.

Detailed maps depicting transmission lines are available from:
Alberta Environment, phone: 427-6323.

B.5.3 IRRIGATION CANALS AND DRAINAGE DITCHES

Detailed blueprints showing position and extent of irrigation networks for each irrigation district can be obtained from the district managers. Addresses and telephone numbers for each irrigation district manager are available in Appendix C.

B.5.4 AIRSTRIPS, WATER LANDING FACILITIES, HELIPORTS

Available information includes:

1. **Air Facilities Map and UFR Supplement to the Air Facilities Map**

   Scale: 1:500000 and 1:1000000

   Information: Existing licenced and unlicenced landing facilities.

   Available: Alberta Aviation Council
   phone: 451-5289.

2. **Air Facility Directory** is also available in the UFR Supplement mentioned above.

B.6 ENVIRONMENTALLY UNIQUE AND PROTECTED AREAS

B.6.1 NATURAL AREAS AND ECOLOGICAL RESERVES

Information available includes:

1. **Natural Areas and Ecological Reserves Maps**

   Information: Shows proposed and established ecological reserves and natural areas for administrative and reference purposes.

   Available: Maps Alberta, AFLW
   phone: 427-3580.

2. **Ecological Land Classification of Banff and Jasper National Parks**

   Information: Three volumes on soil, vegetation and wildlife.

   Available: Maps Alberta, AFLW
   phone: 427-3580.

B.6.2 ENDANGERED SPECIES AND CRITICAL HABITATS

The Fish and Wildlife Division of AFLW has compiled a list of species considered endangered or threatened in Alberta. Information on critical habitats is also available.

For information contact:
Public Information and Extension, AFLW
phone: 427-8580.

APPENDIX C
CONTACTS

Appendix C

TABLE OF CONTENTS

APPENDIX C. RELEVANT CONTACTS AND ADDRESSES

1. Alberta Forestry, Lands and Wildlife C-2
3. Alberta Environment C-10
4. Alberta Transportation and Utilities C-15
5. Energy Resources Conservation Board C-19
6. Alberta Energy C-22
7. Environment Canada C-23
8. Other Relevant Contacts C-23

APPENDIX C

RELEVANT CONTACTS AND ADDRESSES
ALBERTA FORESTRY, LANDS AND WILDLIFE

Special Land Use Branch (Surface Rights)	**(403) 427-3570**

Alberta Forest Service
Forest Land Use Branch
6th Floor, Bramalea Building
9920 - 108 Street
Edmonton, Alberta
T5K 2G6

Resource Specialist (coal mining development, tar sands development)	(403) 427-3588
Resource Specialist (major linear development, reg. pipelines, transmission lines, highways, major industrial roads)	(403) 427-3582
Exploration Resource Specialist (geophysical exploration, coal exploration, sand and gravel exploration)	(403) 427-3582
Land Use Coordinator (forestry field staff coordination on approvals, reclamation and standards for operational matters)	(403) 427-3588
Deputy Secretary, Land Conservation and Reclamation Council (reclamation certificates for non-regulated surface operations)	(403) 427-3582

Provincial Forests

Athabasca Forest
Forest Superintendent
168 Airport Road
Fort McMurray, Alberta
T9H 4P3
(403) 743-7124

Grande Prairie Forest
Forest Superintendent
10811 - 84 Avenue
Grande Prairie, Alberta
T8V 3J2
(403) 538-5390 or 539-1880

Bow-Crow Forest
Forest Superintendent
8660 Bearspaw Dam Road N.W.
Calgary, Alberta
T2M 4L8
(403) 239-0004 or 297-6261

Edson Forest
Forest Superintendent
Bag 9000, 313-50 Street
Edson, Albert
T0E 0P0
(403) 723-8269

Footner Lake Forest
Forest Superintendent
Bag 900
High Level, Alberta
T0H 1Z0
(403) 926-3761

Slave Lake Forest
Forest Superintendent
Box 390
Slave Lake, Alberta
T0G 2A0
(403) 849-3061

Lac la Biche Forest
Forest Superintendent
Box 450
Lac la Biche, Alberta
T0A 2C0
(403) 623-5240/623-5324

Peace River Forest
Forest Superintendent
Bag 900 - 39
Peace River, Alberta
T0H 2X0
(403) 624-6221

Rocky Clearwater Forest
Forest Superintendent
Box 1720
Rocky Mountain House, Alberta
T0M 1T0
(403) 845-8211/845-8250

Whitecourt Forest
Forest Superintendent
Bag 30
Whitecourt, Alberta
T0E 2L0
(403) 778-7153

Public Lands Division

2nd Floor South Tower
Petroleum Plaza
9915 - 108 Street
Edmonton, Alberta
T5K 2C9

Applications and Evaluations	(403) 427-3570
Natural Areas Coordinator	(403) 427-5209
Land Management and Reservation	(403) 427-5209
Industrial Activities Coordinator	(403) 427-5209

Regional and District Offices - White Areas only

Peace River Region

Regional Director
Bag 900, Box 35
Provincial Building
Peace River, Alberta
T0H 2X0
(403) 624-6116/120-6116

Grande Prairie Sub-Region (Regional Supervisor)

Grande Prairie
Provincial Building
10320-99 Street
Grande Prairie, Alberta
T8V 6J4
(403) 538-5260/121-5260

Valleyview
Box 1470
Provincial Building
Valleyview, Alberta
T0H 3N0
(403) 524-5522

Spirit River
Box 579
M&J Building
Spirit River, Alberta
T0H 3G0
(403) 864-3574

Peace River Sub-Region (Regional Supervisor)

Fairview
Box 1509
Provincial Building
Fairview, Alberta
T0H 1L0
(403) 835-2209

High Prairie
Box 1380
Forestry Building
High Prairie, Alberta
T0G 1E0
(403) 523-6580/122-6250

High Level
Box 127
Provincial Building
High Level, Alberta
T0H 1Z0
(403) 926-3512

Peace River
Bag 900, Box 35
Provincial Building
Peace River, Alberta
T0H 2X0
(403) 624-6116/624-6117

North East Region

Regional Director
Eldorado Building
Box 1959, 4916-51 Ave
St. Paul, Alberta
T0A 3A0
(403) 645-6336/139-6336

St. Paul Sub-Region (Regional Supervisor)

St. Paul
Eldorado Building
Box 1959, 4916-51 Ave
St. Paul, Alberta
T0A 3A0
(403) 645-6336/139-6336

Bonnyville
Box 280
Administration Building
Bonnyville, Alberta
T0A 0L0
(403) 826-4297

Wainwright
Box 516
Provincial Building
810-14 Avenue
Wainwright, Alberta
T0B 4P0
(403) 842-7548

Lac La Biche
Box 839
Provincial Building
Lac La Biche, Alberta
T0A 2C0
(403) 623-5279/137-5279

Edmonton Sub-Region (Regional Supervisor)

Athabasca
Box 660
Provincial Building
Athabasca, Alberta
T0G 0B0
(403) 675-4277

Drayton Valley
Box 411
Fidelis Building
Drayton Valley, Alberta
T0E 0M0
(403) 542-3537

Barrhead East
Box 1660
Provincial Building
6203-49 Street
Barrhead, Alberta
T0G 0E0
(403) 674-8231

Centre Plaza
182 - Chippewa Road
Sherwood Park, Alberta
T8A 4H5
(403) 464-7955

Central Region

Regional Director
Box 1598
Provincial Building
Rocky Mountain House, Alberta
T0M 1T0
(403) 845-8240

Calgary
J.J. Bowlen Building
826, 620-7th Avenue S.W.J.J.
Calgary, Alberta
T2P 0Y8
(403) 297-6426/161-6426

Red Deer
Room 405, Parkland Square
4901 - 48th Street
Red Deer, Alberta
T4N 6M4
(403) 340-5451/151-5451

Ponoka
Box 2125
Provincial Building
Ponoka, Alberta
T0C 2H0
(403) 783-7090

Southern Region

Regional Director
Bag 3014
2nd Floor, Sun Centre
530 - 8th Street, South
Lethbridge, Alberta
T1J 2J8
(403) 381-5487/181-5487

Lethbridge
Regional Supervisor
Bag 3014
2nd Floor, Sun Centre
530 - 8th Street, South
Lethbridge, Alberta
T1J 2J8
(403) 381-5487/181-5487

Medicine Hat
116 Chinook Place
623 - 4th Street, South East
Medicine Hat, Alberta
T1A 0L1
(403) 529-3677/184-3677

Eastern Slopes

Regional Director
P.O. Box 1598
Provincial Building
Rocky Mountain House, Alberta
T0M 1T0
(403) 845-8240

Drayton Valley
Regional Supervisor
Box 411
Fidelis Building
Drayton Valley, Alberta
T0E 0M0
(403) 542-3537

Edson
Box 9000
Provincial Building
Edson, Alberta
T0E 0P0
(403) 723-8353/130-8353

Rocky Mountain House
P.O. Box 1598
Provincial Building
Rocky Mountain House, Alberta
T0M 1T0
(403) 845-8240/150-8240

Barrhead West
Box 1660
Provincial Building
6203-49 Street
Barrhead, Alberta
T0G 0E0
(403) 674-8231/134-1231

Lodgepole
Box 411
Fidelis Building
Drayton Valley, Alberta
T0E 0M0
(403) 542-3537

Resource and Planning Division

Maps Alberta, Edmonton
2nd Floor, North Tower, Petroleum Plaza
9945 - 108 Street
Edmonton, Alberta
T5K 2G6
Air photos (403) 427-3519
Maps (403) 427-3520

Calgary
J.J. Bowlen Building
Room 804
620 - 7 Ave., S.W.
T2P 0Y8
Maps (403) 297-7389

Fish and Wildlife Division

2nd Floor, Bramalea Building
9920 - 108 Street
Edmonton, Alberta
T5K 2C9

Fisheries Management	(403) 427-6730
Wildlife Management	(403) 427-6733
Habitat	(403) 427-9505
Land Use Planning and Referrals	(403) 427-6734

FISH AND WILDLIFE CONTACTS

Southern Region
Regional Habitat Technician
Lethbridge
Sun Centre
530 - 8th Street, South
Lethbridge, Alberta
T1J 2J8
(403) 381-5266

Fisheries Biologist
Blairmore
Box 1139
Crowsnest Mall
Blairmore, Alberta
T0K 0E0
(403) 562-7331

Peace River Region
Habitat Assessment Biologist
Peace River
P.O. Box 900-26
Provincial Building
Peace River, Alberta
T0H 2X0
(403) 624-6405

Habitat Biologist
Grande Prairie
#1801 Provincial Building
10320 - 99th Street
Grande Prairie, Alberta
T8V 6J4
(403) 538-5265

Central Region
Regional Habitat Head
Red Deer
3rd Floor, Parkland Square
4901 - 48th Street
Red Deer, Alberta
T4N 6M4
(403) 340-5142

Northeast Region
Regional Habitat Biologist
St. Paul
Box 1450
Eldorado Building
St. Paul, Alberta
T0A 3A0
(403) 645-6313

Habitat Biologist
Edmonton
Main Floor, Room #109
10363 - 108 Street
Edmonton, Alberta
T5J 1L8
(403) 427-3574

Eastern Slopes Region
Regional Habitat Technician
Rocky Mountain House
Provincial Building
Rocky Mountain House, Alberta
T0M 1T0
(403) 845-8230

Habitat Biologist
Calgary
#200 Sloane Square
5920 - 1A Street, S.W.
Calgary, Alberta
T2H 0G1
(403) 297-6423

Habitat Technician
Whitecourt
Provincial Building
Whitecourt, Alberta
T0E 2L0
(403) 778-2515

Habitat Biologist
Edson
Box 1390
Chanking Building
4926 - 1st Avenue
Edson, Alberta
T0E 0P0
(403) 723-8244

ALBERTA ENVIRONMENT CONTACTS

Earth Sciences Division

14th Floor, Standard Life Center
10405 Jasper Avenue
Edmonton, Alberta
T5J 3N4

Drill Inspectors	(403) 427-6190
Groundwater Protection Branch	(403) 427-6190
Groundwater Resources Engineering	(403) 427-2770
Information Services	(403) 427-2770

Environmental Assessment Division

11th Floor, Oxbridge Place (403) 427-6209
9820 - 106 Street
Edmonton, Alberta
T5K 2J6

and

15th Floor, Standard Life Center (403) 427-6208
10405 Jasper Avenue
Edmonton, Alberta
T5J 3N5

Environmental Impact Assessment Review Branch	(403) 427-6224
Regional Land Use Branch	(403) 427-6196
Community Affairs	(403) 427-6225
Restricted Land Use Branch	(403) 427-6208

Land Conservation and Reclamation Division

3rd Floor, Oxbridge Place
9820 - 106 Street
Edmonton, Alberta
T5K 2J6

Development and Reclamation Review Committee	(403) 427-2636
Gravel and Highway Referrals	(403) 427-6323
Pipeline Referrals	(403) 427-6323
Land Conservation and Reclamation Council	(403) 427-6212
Reclamation Branch	(403) 427-4147
Regulated Surface Operations Branch	(403) 427-6323

Land Conservation and Reclamation Council Regional Offices

7th Floor, Provincial buiding (403) 743-7367
9915 - Franklin Avenue
Fort McMurray, Alberta Rite No.
T9H 2K4 136-1367 or 136-1364
Mobile XJ79429

Box 5002 Provincial Building 4920 - 51 Street Red Deer, Alberta T4N 6K8	(403) 340-5310 Rite No. 151-5310 Mobile XJ20333
Provincial Building 200 - 5th Avenue S. Lethbridge, Alberta T1J 4C7	(403) 381-5490 Rite No. 181-5490
Bag 900, Box 5 Provincial Building 2nd Flr., 9621 - 96A Ave. Peace River, Alberta T0H 2X0	(403) 624-6333 Rite No. 120-6333 or 120-1011 Mobile XJ65637
2nd Floor Deerfoot Square 2938-11 Street, N.E. Calgary, Alberta T2E 7L7	(403) 297-5934 or 297-8298 Rite No. 161-5934 or 161-8298
Box 2924 4926 - 1st Avenue Edson, Alberta T0E 0P0	(403) 723-8300 or 723-8231 Rite No. 130-1300 or 130-1011 Mobile XJ77239 and XJ96706
Room 206 770 - 6th Street, S.W. Medicine Hat, Alberta T1A 4J6	(403) 529-3685 Rite No. 184-3685 Mobile XJ83779
Box 3201 Provincial Building St. Paul, Alberta T0A 3A0	(403) 645-6394 Rite No. 139-1394 Mobile XJ75308
2nd Floor, Room 2001 10320 - 99 Street Grande Prairie, Alberta T8V 6J4	(403) 538-5459 Rite No. 121-5459 Mobile XJ97670
Room 117 Provincial Building 4867 - 50th Street Camrose, Alberta T4V 1T6	(403) 679-1238 Rite No. 143-1238 Mobile XJ93782
Box 1088 New Provincial Building 2nd Floor, Center Street Hanna, Alberta T0J 1P0	(403) 854-5579 Rite No. 165-1135 or 165-1101 Mobile XJ22542

2nd Floor, Provincial Building
4709-44th Avenue
Stony Plain, Alberta
T0E 2G0

(403)963-5351
Mobile XJ77595
Mobile XJ27808

Standards and Approvals Division

4th Floor, Oxbridge Place
9820-106 Street
Edmonton, Alberta
T5K 2J6

(403) 427-5883

Pollution Control Division

6th Floor, Oxbridge Place
9820 - 106 Street
Edmonton, Alberta
T5K 2J6

Air Quality Branch	(403) 427-5893
Pesticide Chemicals Branch	(403) 427-5855
Water Quality Control Branch	(403) 427-5828
Waste Management Branch	(403) 427-5868

Technical Services Division

10th Floor, Oxbridge Place
9820 - 106 Street
Edmonton, Alberta
T5K 2J6

(403) 427-6276

Water Resources Administration Division

3rd Floor, Oxbridge Place
9820 - 106 Street
Edmonton, Alberta T5K 2J6

Ground Water Rights Branch	(403) 427-6241
Hydro-Electric Branch	(403) 427-6111
Surface Water Rights Branch	(403) 427-7044
Regional Services - Branch Head	(403) 427-6168

Water Resources Regional Administrators

Peace River Regional Office (403) 624-6167
Provincial Building
9621 - 96A Avenue, Bag 900-5
Peace River, Alberta
T0H 2X0

Edmonton Regional Office (403) 427-5296
Standard Life Centre
10405 - Jasper Avenue
Edmonton, Alberta
T5J 3N4

Red Deer Regional Office (403) 340-5310
4920 - 51 Street
Red Deer, Alberta
TAN 6K8

Calgary Regional Office (403) 297-6582
Deerfoot Square
3rd Floor, 2938 - 11th St. N.E.
Calgary, Alberta
T2E 7L7

Lethbridge Regional Office (403) 381-5399
Provincial Building
200 - 5th Avenue South
Lethbridge, Alberta
T1J 4C7

Irrigation Districts

Aetna Irrigation District
P.O. Box 1680
Cardston, Alberta
T0K 0K0
(403) 653-4160

Bow River Irrigation District
P.O. Box 140
Vauxhall, Alberta
T0K 2K0
(403) 654-2111

Eastern Irrigation District
P.O. Box 8
Brooks, Alberta
T0J 0J0
(403) 362-4532

Raymond Irrigation District
Raymond, Alberta
T0K 2S0
(403) 752-3334

Ross Creek Irrigation District
P.O. Box 576
Medicine Hat, Alberta
T1A 7G5
(403) 527-0208

St. Mary River Irrigation District
P.O.Box 278
Lethbridge, Alberta
T8J 3Y7
(403) 328-4401

Leavitt Irrigation District
Cardston, Alberta
T0K 0K0
(403) 653-3376

Lethbridge Northern Irrigation District
334 - 13 Street North
Lethbridge, Alberta
(403) 327-3302

Magrath Irrigation District
Magrath, Alberta
T0K 1J9
(403) 758-6617

Mountain View Irrigation District
Mountain View, Alberta
T0K 1N0
(403) 653-2358

Taber Irrigation District
P.O. Box 129
Taber, Alberta
T0K 2G0
(403) 223-2148

United Irrigation District
Glenwood, Alberta
T0K 2R0
(403) 626-3255

Western Irrigation District
P.O. Box 714
Strathmore, Alberta
T0J 3H0
(403) 934-3542

ALBERTA TRANSPORTATION AND UTILITIES CONTACTS

District Transportation Engineers

Mr. A. Waller
District Transportation Engineer - District 1
Provincial Administration Building
#1 1015 - 30 Street S.W.
Medicine Hat, Alberta T1B 3N3
(Direct Line 184-3640)
(Long Distance 529-3460)

County of Newell #4
County of Forty Mile #8
Improvement District #1

Mr. Blair Peacock
District Transportation Engineer - District 2
4th Floor, Administration Building
9th Street & 3rd Avenue, North
Lethbridge, Alberta
T1H 0H5
(Direct Line 329-5480)
(Long Distance 381-5480)

County of Warner #5
County of Vulcan #2
County of Lethbridge #26
Improvement District #4
Improvement District #6
M.D. of Cardston #6
M.D. of Taber #14
M.D. of Willow Creek #26
M.D. of Pincher Creek #9

Mr. Harry Protopappas
District Transportation Engineer - District 4
Room 107, Hill Park Plaza
2411 - 4th Street, N.W.
Calgary, Alberta
T2M 2Z8
(Direct Line 161-6311)
(Long Distance 297-6311)

County of Wheatland #16
County of Mountain View #17
M.D. of Foothills #31
M.D. of Rocky View #44
Improvement District #8
Improvement District #5

Mr. Monty McGregor
District Transportation Engineer - District 3
Box 1300
Hanna, Alberta
T0J 1P0
(Direct Line 165-1140)
(Long Distance 854-5550)

M.D. of Acadia #34
M.D. of Starland #47
M.D. of Kneehill #48
Special Area 2
Special Area 3

Mr. Keith Helberg
District Transportation Engineer - District 6
4th Floor, Provincial Building
4920 - 51 Street
Red Deer, Alberta
T4N 6K8
(Direct Line 151-5200)
(Long Distance 340-5200)

County of Ponoka #3
County of Lacombe #14
County of Wetaskiwin #10
County of Red Deer #23
M.D. #99
Improvement District #11

Mr. Harry Kushnir District Transportation Engineer - District 5 Postal Bag 800 Stettler, Alberta T0C 2L0 (Direct Line 153-1101) (Long Distance 742-7577)	County of Stettler #6 County of Paintearth #18 County of Camrose #22 County of Flagstaff #29 M.D. of Provost #52 Special Area #4
Mr. Lloyd Werboweski District Transportation Engineer - District 10 P.O. Box 690 Vermilion, Alberta T0B 4M0 (Direct Line 141-1011) (Long Distance 853-8178	County of Beaver #9 County of Lamont #30 County of Minburn #27 County of Two Hills #21 County of Vermilion River #24 M.D. of Wainwright #61
Mr. John Schroder District Transportation Engineer - District 11 Box 1529 Lac La Biche, Alberta T0A 2C0 (Long Distance 623-5250) (Direct Line 137-1250)	County of Smoky Lake #13 County of St. Paul #19 M.D. of Bonnyville #87 Improvement District #18 Improvement District #24
Mr. Joe Schlaut District Transportation Engineer - District 7 #203 Bedford Square 4209 - 99 Street Edmonton, Alberta T6E 5V7 (Direct Line 463-7227)	County of Leduc #25 County of Strathcona #20 County of Parkland #31 County of Lac Ste. Anne #28 M.D. of Sturgeon #90
Mr. R.A. Oberg District Transportation Engineer - District 8 Bag 9000, 111-54 Street Edson, Alberta T0E 0P0 (Direct Line 130-1165) (Long Distance 723-8250, Ext. 37, 38, 15)	Improvement District #14 *Part of I.D. #15 (includes Twp 56-10-5 Twp 56-11-5 Twp 56-12-5 Twp 57 Ranges 10 to 13 W5th Twp 58 Ranges 10 to 17 W5th Twp 59 Ranges 9 to 18 W5th Twp 60 Ranges 13 to 17 W5th) *Part of I.D. #16 (includes Twp 54-12-6 to B.C. Border Twp 55-10-6 to B.C. Border Twp 56-2-6 to B.C. Border Twp 57-1-6 to B.C. Border)

Mr. Gorden Zack District Transportation Engineer - District 9 Box 1078 Athabasca, Alberta T0G 0B0 (Long Distance 675-2624)	County of Barrhead #11 County of Thorhild #7 County of Athabasca #12 Municipal District #92 Improvement District #15 *Improvement District #17 (includes Twp. 65 Ranges 25 to 27 W4th Twp. 65 Ranges 1 to 2 W5th Twp 66 Ranges 25 to 27 W4th Twp 66 Ranges 1 & 2 W5th Twp 67 Ranges 25 to 27 W4th Twp 67 Ranges 1 & 2 W6th Twp 68 Ranges 25 to 27 W4th Twp 69 Ranges 23 to 27 W4th Twp 69-1-5 Twp 70 Ranges 19 to 27 W4th Twp 70-1-5 Twp 71 Ranges 19 to 26 W4th Twp 71 Ranges 1 & 2 W5th Twp 72 Ranges 19 to 26 W4th Twp 72 Ranges 1 & 2 W5th Twp 73 Ranges 18 to 26 W4th Twp 73 Ranges 1 & 2 W5th Twp 74 Ranges 22 to 25 W4th Twp 74-1-5 Twp 75 Ranges 22 to 26 W4th Twp 75-1-5 Twp 64 Ranges 1 to 13 W4th Twp 65 Ranges 1 to 13 W4th Twp 66 Ranges 1 to 13 W4th Twp 67 Ranges 1 to 13 W4th)
Mr. Clarence Dewald District Transportation Engineer - District 13 8424 - 108 Street Grande Prairie, Alberta T0G 1E0 (Direct Line 121-5310) (Long Distance 538-5310)	County of Grande Prairie #1 M.D. of Spirit River #133 *Improvement District #16 Improvement District #19 Improvement District #20
Mr. Alan Griffith District Transportation Engineer - District 12 Box 550, High Prairie, Alberta T0G 1E0 (Long Distance 523-3545) (Direct Line 122-6620)	M.D. of Smoky River #130 Improvement District #17 (includes remainder of I.D. not shown in District 9)

Mr. Roy Callioux
District Transportation Engineer - District 14
P.O. Box 25, Bag 900, Provincial Building
Peace River, Alberta
T0H 2X0
(Direct Line 120-6130)
(Long Distance 624-6130 Ext. 31, 32)

M.D. of Peace #135
M.D. of Fairview #136
Improvement District #21
Improvement District #22

Mr. Howard Wray
District Transportation Engineer - District 15
P.O. Box 1045
High Level, Alberta
T0H 1Z0
(Long Distance 926-2241)

Improvement District #23

ENERGY RESOURCES CONSERVATION BOARD CONTACTS

Development and Pipeline Department

640 - 5 Avenue S.W.
Calgary, Alberta
T2P 3G4
Telex 03-82-17-17

(403) 297-3417
(After hours and holidays only)
(403) 297-8311

Manager, Development Department	(403) 297-8169
Manager, Environment Protection Department	(403) 297-8121
Assistant Manager, Drilling & Protection	(403) 297-8172
Assistant Manager, Field Operations	(403) 297-8174
Assistant Manager, Environment Protection	(403) 297-3721
Technical Specialist - Drilling & Production	(403) 297-8283
Senior Drilling & Production Engineer	(403) 297-2429
Senior Staff Supervisor, Field Operations	(403) 297-3708
Supervisor of Well Licensing	(403) 297-8159
Supervisor, Production	(403) 297-8132
Supervisor, Drilling Section	(403) 297-8185
Supervisor, Environment Protection	(403) 297-3730

Development Department - Area Offices

Bonnyville Office — (403) 826-5352 (24 hours)
P.O. Box 1969, Northlands Development Building
49 Street & 50 Avenue
Bonnyville, Alberta
T0A 0L0
Area Supervisor - G.A. (Guy) Hurtubise
Assistant Area Supervisor - R.B. (Roger) Gagnon

Calgary South Office — (403) 256-1474 (24 hours)
Room 210, Midnapore Professional Building
239 Midpark Way S.E.
Calgary, Alberta
T2X 1M2
Area Supervisor - S.G. (Stew) Slymon
Assistant Area Supervisor - B.M. (Bernie) MacKay

Drayton Valley Office — (403) 542-5182 (24 hours)
Box 390
51 Avenue & 52 Street
Drayton Valley, Alberta
T0E 0M0
Area Supervisor - J.E. (Jim) Reid
Assistant Area Supervisor - D.B. (Dan) Sarnecki

Edmonton Office (403) 427-0200 (24 hours)
145 Street and 123 Avenue
MAILING ADDRESS:
P.O. Box 3560
Postal Station "D"
Edmonton, Alberta
T5L 4J6
Area Supervisor - B.E. (Brian) McFarlane
Assistant Area Supervisor - V.F. (Vern) Jones
Supervisor, Pipeline Inspection - R.L. (Lloyd) Bowhay

Whitecourt Sub-office (403) 778-3812 (24 hours)
(Operated through the Edmonton Office)
Provincial Building
5020 - 52 Avenue
Whitecourt, Alberta
T0E 2L0
Supervisor - K.B. (Ken) McMorris

Grande Prairie Office (403) 538-5138 (24 hours)
#200, 11209 - 98 Avenue
Grande Prairie, Alberta
T8V 5A5
Area Supervisor - D.T. (Dennis) McCullough
Assistant Area Supervisor - D.A. (Darrold) Banta

Medicine Hat Office (403) 527-3385 (24 hours)
Box 909
1609 Brier Park Road N.W.
Medicine Hat, Alberta
T1A 7G8
Area Supervisor - R. (Ron) Elle
Assistant Area Supervisor - M.H. (Marvin) McNeil

Red Deer Office (403) 340-5454 (24 hours)
2nd Floor, Provincial Building
4920 - 51 Street
Red Deer, Alberta
T4N 6K8
Area Supervisor - D.L. (Don) Skappak
Assistant Area Supervisor - E.F. (Ed) May
Supervisor, Pipeline Inspection - D.J. (Don) Knopp

Wainwright Office (403) 842-4431 (24 hours)
Box 1506
1037 - 2 Avenue
Wainwright, Alberta
T0B 4P0
Area Supervisor - M. (Metro) Koziol
Assistant Area Supervisor - D.C. (Dave) DeGagne
Supervisor, Pipeline Inspection - W. (Wayne) Green

Environment Protection Department - Chemical Laboratory

3512 - 33 Street N.W. (403) 297-2450
Calgary Alberta
T2L 2A6
Chief Chemist - M. L. (Merl) Korchinski
Key: (AH + HO) - After Hours & Holidays Only

ALBERTA ENERGY CONTACTS

Oil and Gas Agreements

11th Floor, South Petroleum Plaza
9945 - 108 Street
Edmonton, Alberta
T5K 2C9

Agreements and Licence	(403) 427-7744
Lease Administration	(403) 427-7744
Oil and Gas Agreement Sales	(403) 427-7709
Agreements Administration	(403) 427-7744

Mineral Agreements

11th Floor, South Petroleum Plaza
9945 - 108 Street
Edmonton, Alberta
T5K 2C9

Oil Sands Agreements	(403) 427-7708
Coal Agreements	(403) 427-7712

ENVIRONMENT CANADA CONTACTS

Atmospheric Environment Service

Western Region
Twin Atria Building
4999 - 98 Avenue
Edmonton, Alberta
T6B 2X3

Historical Climatological Data	(403) 466-7721
Alberta Weather Centre	(403) 468-7931

Water Survey of Canada (403) 292-5320
Environment Canada
Room 854
220 4th Ave. S.E.
Calgary, Alberta
T2P 2M7

OTHER RELEVANT CONTACTS

Alberta Aviation Council (403) 451-5289
67 Airport Road
Municipal Airport
Edmonton, Alberta
T5G 0W6

Alberta Government Telephone Directory (403) 427-4952/427-4971
11510 Kingsway Ave.
Queens Printer
Edmonton, Alberta
T5G 0X5

Alberta Transportation and Utilities
Construction Programs
2nd Floor, Twin Atria Building
4999 - 98 Avenue
Edmonton, Alberta
T6B 2X3

Regional Transportation	(403) 427-3127
Road Bans	(403) 427-7991
Safety Branch	(403) 427-7914

Municipal Affairs (403) 427-2995
7th Floor, Jarvis Building
9925-107 Street
Edmonton, Alberta
T5K 2H9

Program Development Branch Recreation & Parks 6th Floor Standard Life Centre 10405 Jasper Avenue Edmonton, Alberta T5J 3N4	(403) 427-8758
Land Use Planning Branch Alberta Agriculture 7000-113A Street Edmonton, Alberta	(403) 427-5359
American Petroleum Institute Publications and Distribution Section Washington, D.C. U.S.A. 20005	(202) 682-8375
Archaeological Survey of Alberta Resource Management Section 8820 - 112 Street Edmonton, Alberta T6G 2P8	(403) 431-2300
Farmers' Advocate of Alberta Alberta Agriculture 3rd Floor, J.G. O'Donahue Building 7000 - 113 Street Edmonton, Alberta T6H 5T6	(403) 427-2433
Regulatory Permit Services David Bromley Engineering Ltd. 10532 - 110 Street Edmonton, Alberta T5H 3C5	(403) 423-4123
Petroleum Industry Training Service Head Office #13, 2115 - 27 Avenue N.E. Calgary, Alberta T2E 7E4	(403) 250-9606 Telex 03-822806
Petroleum Industry Training Service Box 485 10-20 Avenue Nisku, Alberta T0C 2G0	(403) 955-7770

Natural Resources Division (403) 450-5111
Alberta Research Council
Civil Engineering Department
P.O Box 8330
Station F
250 Karl Clark Road
Edmonton, Alberta
T6H 5X2

Library Services (403) 450-5111
Alberta Research Council
P.O. Box 8330
Station F
250 Karl Clark Road
Edmonton, Alberta
T6H 5X2

Soils Branch (403) 427-5373
Plant Industry Division
Alberta Agriculture
2nd Floor, J.G. O'Donahue Building
7000 - 113 Street
Edmonton, Alberta
T6H 5T6

Soil Survey of Alberta (403) 438-7555
Alberta Research Council
5th Floor, Terrace Plaza
4445 Calgary Trail South
Edmonton, Alberta
T6H 5R7

APPENDIX D

PERMITS, LICENCES AND APPROVALS

APPENDIX D
PERMITS, LICENCES AND APPROVALS

The following are examples of permits, licences and approvals relevant to the oil and gas industry. They have been arranged according to the alphabetic order of the Acts to which they pertain.

AGRICULTURAL CHEMICALS ACT:

- Application for a Permit to Apply Pesticides in, or within, 30 Horizontal Metres of an Open Body of Water for the Control of Vegetation
- Application for a Permit to Apply Herbicides for the Control of Vegetation within the Green Area of the Province of Alberta (Form 84-B1)

CLEAN AIR ACT:

- Application for Permit or Licence

CLEAN WATER ACT:

- Application for Permit or Licence

FORESTS AND PRAIRIE PROTECTION ACT:

- Fire Permit (FP 69)

INITIAL ENVIRONMENTAL INVESTIGATION:

- Exploration Application Supplement - Initial Environmental Investigation
- Land Disposition Application Supplement - Initial Environmental Investigation (1-51-80-09)

MINES AND MINERALS ACT:

- Permit to Conduct Geophysical Operations (Form #3)

OIL AND GAS CONSERVATION ACT:

- Application for a Well License (ED-1-85-3)
- Application for License to Drill (ED-6-80-11)
- Application to Report Production for a Battery or Group (S-7-85-01)
- Approval for Construction and Operation of a Battery or Group
- Application for a Production Spacing Unit Order (0-41-78-09)
- Notice of Commencement or Suspension of Production or Injection at a Well (S-4-86-07)
- Monthly Water Disposal or Injection System Statement (S-18-79-01)
- Application to Abandon, Plug Back, or Abandon a Zone (ED-21-83-06)

PIPELINE ACT, 1975:

- Pipeline Application Permit-License (PL-100-86-03)

PUBLIC LANDS ACT:

- Application for License of Occupation, Installation Lease, Pipeline Agreement, Mineral Surface Lease, REA Easement, Easement (LS 12/87)
- Surface Materials Application (LS 24/86)

- Application for Miscellaneous Permit, Miscellaneous Lease (LS 1/86)
- Application for Amendment to Existing Land Disposition (LS 2/87)

WATER RESOURCES ACT:

- Application for Licence - WR1 (DEC/83)
- Application for Drainage Licence - WR1A (NOV/82)
- Application for Permit - WR1B (SEPT/82)
- Application for Exploration Permit - WR1C (SEPT/82)

Alberta
ENVIRONMENT
Pollution Control Division
Pesticide Chemicals Branch

APPLICATION FOR A PERMIT TO APPLY PESTICIDES IN, ON OR WITHIN 30 HORIZONTAL METRES OF AN OPEN BODY OF WATER FOR THE CONTROL OF VEGETATION

SAMPLE ONLY

Please type or print clearly in ink.

Refer to the terms and conditions on the reverse side.

Return the blue and pink copies, with a map of the proposed treatment area, to:

Alberta Environment
Pesticide Chemicals Branch
200 – 5 Avenue South
LETHBRIDGE, Alberta
T1J 4C7

Alberta Environment
Pesticide Chemicals Branch
9820 – 106 Street
EDMONTON, Alberta
T5K 2J6

1. The applicant ______________________ (NAME OF APPLICANT), ______________________ (BUSINESS ADDRESS), ______________ (BUSINESS TELEPHONE), through its authorized representative, ______________________ (NAME OF AUTHORIZED REPRESENTATIVE) hereby make application for a permit to apply pesticides in, on, or within thirty horizontal metres of an open body of water in the Province of Alberta for the control of vegetation, in compliance with Section 3 of Alberta Regulation 213/80.

2. Name of Applicator ______________________, ______________________ (BUSINESS ADDRESS) ______________ (BUS. TELEPHONE)

3. The pesticide application is to be made to or over an open body of water ______________ or over land within 30 horizontal metres of an open body of water ______________ .

4. Details of Control Program:

i. Herbicide	Product Name: ________ P.C.P. Number:	Product Name: ________ P.C.P. Number:	Product Name: ________ P.C.P. Number:
ii. Target Vegetation (species)			
iii. Application Rate			
iv. Application Method	underwater injection ____ surface spray ____ foliar spray ____ drawdown treatment ____ soil treatment ____ other (specify) ________	underwater injection ____ surface spray ____ foliar spray ____ drawdown treatment ____ soil treatment ____ other (specify) ________	underwater injection ____ surface spray ____ foliar spray ____ drawdown treatment ____ soil treatment ____ other (specify) ________
v. Application Equipment	spray boom ____ spray gun ____ injection apparatus ____ aircraft ________ other ________	spray boom ____ spray gun ____ injection apparatus ____ aircraft ________ other ________	spray boom ____ spray gun ____ injection apparatus ____ aircraft ________ other ________
vi. Name and Type of Water Body (ies)			
vii. Use(s) of Water Body to be Treated	irrigation ____ drainage ____ human consumption ____ livestock consumption ____ recreation ____ other (specify) ________	irrigation ____ drainage ____ human consumption ____ livestock consumption ____ recreation ____ other (specify) ________	irrigation ____ drainage ____ human consumption ____ livestock consumption ____ recreation ____ other (specify) ________
viii. Proposed Application Dates	Start: ________ Finish: ________	Start: ________ Finish: ________	Start: ________ Finish: ________

5. Submit, with this application for permit, a map of the proposed treatment area(s). See instruction sheet for details.

I certify that, to the best of my knowledge, the information in this application is true, complete and accurate and I understand the Terms and Conditions on the reverse side of this application. I agree to abide by any permit issued by the Alberta Department of the Environment, Pollution Control Division. Dated at ______________________ this ______________ day of ______________________ , 198 __

____
SIGNATURE OF AUTHORIZED REPRESENTATIVE

____
TITLE OF AUTHORIZED REPRESENTATIVE

Alberta
ENVIRONMENT
Environmental Protection Services
Pollution Control Division
Pesticide Chemicals Branch

APPLICATION FOR A PERMIT TO APPLY HERBICIDES FOR THE CONTROL OF VEGETATION WITHIN THE GREEN AREA OF THE PROVINCE OF ALBERTA

Please type or print clearly in ink.

Refer to the terms and conditions on the reverse side.

Return the pink and yellow copies, with maps of the proposed treatment site to:

Alberta Environment
Pesticide Chemicals Branch
5th Flr., 9820 - 106 Street
Edmonton, Alberta
T5K 2J6

Retain the green copy for your records.

File Number ______________
Permit Number(s) ______________
GOVERNMENT USE ONLY

SAMPLE ONLY

1. The applicant ______________ (Name of Applicant), ______________ (Business Address). ______________ (Business Telephone), through its authorized representative ______________ (Name of Authorized Representative) hereby make application for a permit to apply herbicides, for the control of vegetation within the Green Area of the Province of Alberta in compliance with Section 5 of Alberta Regulation 2[illegible]/8[illegible].

2. Name of treatment site ______________

3. Legal description and Public Lands Disposition Number of treatment site. Please list or show on attached maps.

Public Lands Disposition Number	Legal Description

4. Do you intend to apply herbicides beyond your present disposition boundaries? Yes ______ No ______

5. Width of treatment ______________

6. Herbicides to be applied

Active Ingredient	Trade Name	P.C.P. Number	Target Species

7. Method of application ______________

8. Specify the environmentally sensitive situations that exist on the treatment site and indicate what precautions will be taken at these locations. ______________

9. Proposed date of application - Start ______________ Finish ______________

10. Applicant's comments ______________

I certify that, to the best of my knowledge, the information in this application is true, complete and accurate and I understand the Terms and Conditions on the reverse side of this application. I agree to abide by any permit issued by the Alberta Department of Environment, Pollution Control Division. Dated at ______________ this ______________ day of ______________, 198______.

____
Signature of Authorized Representative

____
Title of Authorized Representative if applicant is a partnership or a corporation

Form 84 - 81

ENVIRONMENT

Alberta
ENVIRONMENT
Environmental Protection Services
Standards and Approvals Division

9820 - 106 Street, Edmonton, Alberta, Canada T5K 2J6 Air Quality Branch 403/427-5872 Water Quality Branch 403/427-5888
Telex 037-2006, TWX 610-831-2636

SAMPLE ONLY

APPLICATION FOR A PERMIT OR LICENCE

THE CLEAN AIR ACT

CHAPTER C-12 REVISED STATUTES OF ALBERTA 1982

To: ALL APPLICANTS

The completed application and attachments are to be sent to:

Department of the Environment
Standards and Approvals Division
Air Quality Branch
[illegible]th Floor, Oxbridge Place
[illegible]20 - 106th Street
EDMONTON, Alberta
T5K 2J6

1. All sections to be completed by applicant except as noted in 2.
2. If an application for a licence is being made Section 2 need not be completed if a permit has been issued and the plant has been constructed fully in accordance with the information supplied in the permit application.
3. Where sufficient space has not been provided, additional data sheets may be attached by the applicant.

APPLICATION FOR A PERMIT OR LICENCE

THE CLEAN AIR ACT

Application No. ____________
Date Received ____________
Reviewed By ____________
Permit No. ____________
Date Approved ____________
Licence No. ____________
Date Approved ____________

For Office Use Only

SAMPLE ONLY

SECTION ONE: GENERAL

1.0 Date of application: ____________

1.1 Name of plant operator: ____________
(Company or Corporation)

____
(Owner or Agent, if different from operator)

1.2 Address of operator: ____________

1.3 Telephone number: ____________

1.4 Location of plant: ____________

____

or ___ 1/4, ___ 1/4, ___ Sec. ___, Twp. ___. Rge. ___

____________ Meridian.

1.5 Applica[illegible]) A permit ___; (2) A licence ___; (3) Amendment of a permit ___; (4) Amendment of a licence ___;

If permit: (or amendment to)
(a) Construction of a new plant ____________;
(b) Modification, alteration, or addition to an existing plant ____________;
(c) Permit Number ____________.

If Licence: (or amendment to)
Has a permit been granted? YES ________; NO ________.
If yes, permit number ____________.

1.6 Expected starting and completion dates ____________

____________.

SECTION TWO: DESIGN AND EMISSION INFORMATION

2.0 The applicant shall provide the following information as part of the submission. In the case of an amendment to a permit and/or licence, the applicant should review the following section and present only material concerning the changes to the operation relative to the previous material already supplied.

2.1 Scale diagrams of the plant and the surrounding area are required. These diagrams shall include:

- .1 topography of the area;
- .2 property boundaries and land use of the area;
- .3 the location of the plant site;
- .4 location and types of all buildings;
- .5 the exact location and name of all equipment used in manufacturing, processing or storage and other units;
- .6 location and name of all equipment used in control, treatment and release of air contaminants; and
- .7 location of all atmospheric discharge points.

2.2 A flow diagram as well as a general narrative description of the manufacturing processes or operations involved and the pollution control facilities is required. This information shall be accompanied by a statement of:

- .1 the design capacity of the proposed plant or thing and the size and capacity of the air pollution control equipment;
- .2 the method by which and the manner in which any air contaminant will be released to the atmosphere (this would include discharges from safety relief devices);

SAMPLE ONLY

.3 the composition of every effluent stream which will be emitted by or from the plant or thing;

.4 the volumetric and mass rate of release of each constituent of every effluent stream under normal and maximum operating conditions;

.5 whether the composition or any of the effluent streams will vary under different operating conditions, whether the operating conditions are internal or external in nature;

.6 the exit temperature and velocity of every effluent stream under normal and maximum operating conditions;

.7 the height and diameter of all discharge stacks and the elevation above grade of all discharge points;

.8 the calculated ground level concentration of every air contaminant (except particulates) released by or from the plant or thing under normal and maximum operating conditions;

.9 identification of toxic materials and odorous compounds.

2.3 List the unit products resulting from the processing operations. List the unit of production per operating day.

2.4 List the type and quantity of raw materials required for the manufacturing process or operation.

SAMPLE ONLY

2.5 List the type and quantity of chemicals required for the manufacturing process or operation.

NOTE: A MATERIAL BALANCE STATEMENT MUST BE SUBMITTED WITH SECTIONS 2.3.0, 2.4.0 and 2.5.0

SECTION THREE: STATEMENTS

3.0 The applicant shall discuss the following points:

- .1 describe the different processes or operations that may cause different rates of contamination. Describe and show how they will be different.
- .2 describe the potential for accidents and emergencies and the contingency procedures to minimize the potential damage.
- .3 proposed method and frequency for monitoring contaminant emissions, volume flow rates, and concentrations of effluent contaminants.
- .4 a statement assessing the impact of the operation or manufacturing process on the surrounding environment. This statement should be drawn up in such a manner as to indicate to the Department the company's awareness of its interaction with the ecosystem and indicate all the measures that have or will be taken to minimize this interaction.

SAMPLE ONLY

SECTION FOUR

4.0 This application is submitted in accordance with the Clean Air Act, 1982 and it is understood that the Director of the Division of Standards and Approvals may require the applicant to submit any additional information that the Director considers necessary regarding the proposed facility.

An application for a Permit or Licence shall not be deemed to be filed until the Division has received, at the designated address, all the information, documents, and authorization requested in the application form or additional information requested by the Director of the Division of Standards and Approvals.

SAMPLE ONLY

(Date)

(Signature)

(Title of Signer)

NOTE: The application must be signed by the owner or his agent.

Alberta
ENVIRONMENT
Environmental Protection Services
Standards and Approvals Division

9820 - 106 Street, Edmonton, Alberta, Canada T5K 2J6 Air Quality Branch 403/427-5872 Water Quality Branch 403/427-5888
Telex 037-2006, TWX 610-831-2636

SAMPLE ONLY

The Clean Water Act

Application for A Permit or Licence

To: ALL APPLICANTS

1. Section One is to be completed by all applicants.

2. Section Two is to be completed by applicants for:

   (a) a permit to construct a water facility;
   (b) a permit to alter, add to, or change an existing water facility;
   (c) a licence to operate a water facility.

   NOTE: Where the applicant wishes to alter, add to, or change an existing water facility, the applicant must provide information which relates to the new operating level.

3. This application is to be completed to a level of completeness as determined by the Water Quality Branch of the Standards and Approvals Division.

4. Section Four is to be signed in the appropriate space.

5. Where sufficient space has not been provided in the above mentioned sections, additional data sheets may be attached by the applicant.

6. Sections not applicable can be marked N/A.

7. The completed application and attachments are to be sent to:

Director of Standards and Approvals
Standards & Approvals Division
Alberta Environment
4th Floor, Oxbridge Place
9820 - 106 Street
EDMONTON, Alberta
T5K 2J6

Long Form
December, 1982

The Clean Water act

Application for A Permit or Licence

Application No.: ____________

Date Received: ____________

Review by: ____________

For Office Use Only

SAMPLE ONLY

Section One: General Information

1.0 Date of Application: ____________

1.1 Name of Applicant: ____________
(Company or Corporation)

____
(Owner or Agent)

1.2 Name of Plant or Facility: ____________

1.3 Address of Applicant:

____
(Street, Avenue, Road, R.R., Box, etc.City, Town, Village, Postal Code)

1.4 Telephone Number: ____________

1.5 Location of Facility:

a) ____________
(Street, Avenue, Road, R.R., Box, etc.City, Town, Village, Postal Code)

or b) LSD ___, 1/4, Section ___, Township ___, Range ___, __ Meridian.

1.6 Application For:

(1) A Permit _____	(2) Permit Amendment _____
(3) A Licence _____	(4) Licence Amendment _____

1.7 Summary of Project: ____________

____

____

1.8.0 Duration of the Project: ______________________

Construction Commencement Date: ______________________

Construction Completion Date: ______________________

1.8.1 Estimated Project Costs:

	Capital Cost Construction & Equipment ($)	Annual Operating Cost ($)
Water Pollution Abatement Equipment		
Air Pollution Abatement Equipment		
Other		
TOTAL		

SAMPLE ONLY

1.9.0 Pr[illegible]s approvals issued for the applied project:

.1 Department of the Environment, Water Permit No. ______________

.2 Department of the Environment, Water Licence No. ______________

.3 Other Approvals ______________________

____

Section Two: Design and Emission Information

2.0.0 The applicant shall provide the following information as part of the submission. In the case of an amendment to a permit and/or a licence, the applicant should review the following section and present that material concerning the changes to the operation relative to the previous material already supplied.

2.1.0 Scale diagrams of the plant and the surrounding area are required. These diagrams shall include:

.1 topography of the area;

.2 property boundaries and land use of the area;

.3 location and types of all buildings;

.4 the exact location and name of all equipment used in manufacturing, processing or storage and other units;

.5 location and name of all equipment used in control, treatment and disposal of waste water;

.6 location of all sewer lines;

.7 location of all discharge points; and

.8 the location of the plant site.

NOTE: These diagrams may also include the surface drainage information specified in Section 2.8.1.

2.2.0 A flow diagram of the manufacturing process(es) or operation(s) involved, the waste water treatment facilities, and a general narrative description is required, including equipment and unit capacities.

SAMPLE ONLY

2.3.0 List the unit products resulting from the processing operations, specifying the production unit.

Products	Units of Products	
	Per Typical Operating Day	Per Day At Maximum Capacity

SAMPLE ONLY

2.4.0 List the raw materials required for the manufacturing process or operation.

Type of Raw Materials	Typical Quantity Per Day (tonnes/day)

2.5.0 List the chemicals required for production, the manufacturing process or operation.

Type of Chemicals	Typical Quantity Per Day (kg/day)

NOTE: A material balance flow sheet (block diagram) for the entire plant operations must be submitted.

2.6.0 Water Supply: List the source of water supply, its purpose and quantity.

Type of Operation	Source of Water	Total Consumption (m^3/day)

SAMPLE ONLY

2.7.0 Final Liquid Effluent Discharged: Identification of Water Contaminants.

Total volume per day ________ m^3.

Water Contaminant	Concentration (mg/l)	Discharge Rate		Continuous Discharge or Intermittent	Frequency (If Intermittent)
		(kg/day)	kg/unit of production		

*eg. BOD_5, COD, Total Suspended Solids, Heavy Metals, Odours, Phenols, Sulphides, Oil and Grease, Phosphates, Ammonia-Nitrogen, etc.

SAMPLE ONLY

2.7.1 Liquid Effluent: Identification of Individual Sources

Source of Liquid Effluent	Volume (m^3/day)	Temperature (°C)	pH	Principal Water Contaminants	Frequency of Discharge

2.7.2 Cooling Water: Once Through ______

Circulating ______

Flow Rate (m^3/day)	Water Temperature (°C)		If Circulating System Blowdown Rate (m^3/day)	Rate Dissipation In Receiving Water (Kilojoules/hr)
	Intake	Discharge		

SAMPLE ONLY

Conditioner Added to Cooling Water*	Name of Compound	Final Concentration* (mg/l)	Frequency of Application

* Biocides, Fungicides, Corrosion Inhibitors, etc.

Note: A water balance flow sheet (block diagram) for the entire plant must be submitted.

SAMPLE ONLY

2.7.3 Raw Water Treatment

(a) Filter Backwash ______

(b) Boiler Blowdown ______

(c) Ion Exchange Resin Regeneration ______

(d) Removal of Sludge, Deposition, Corrosive Materials ______

(e) Other ______, please give details ______________________

____

____.

(f) Method of Disposal of Treatment Wastes ______________________

____.

2.7.4 Sanitary Sewage Effluent:

(a) Number of Personnel ______________________

(b) Volume of Water Discharged ______________________(m^3/d)

(c) Method of Disposal of the Sanitary Sludge ______________________

____.

Note: (i) If the disposal is to a municipal sewage system, a letter of confirmation from the municipality must be submitted.
(ii) When disposal is to a septic tank and field, leaching cesspool or any other approved in-ground disposal system, confirmation from the Plumbing Inspections Branch of Alberta Labour approving the design of the system must be supplied.

2.8.0 Surface Drainage:

.1 Topographic map(s) shall be submitted, showing the following:

(a) Plant site and any associated mine site layout with major facilities

(b) Off-site areas contributing storm water runoff to the site surface drainage system

(c) Facilities provided for the collection, segregation, protection, treatment and discharge of storm water runoff from the various areas of the site and off-site.

Note: The topographic map(s) should reflecxt any proposed contour changes to the natural topography.

.2 The following storm runoff information shall be submitted for the site(s):

(a) Area contributing surface runoff - Ha

(b) Runoff Volume from a 10-year storm of 24-hour duration - m^3 (based on the applicable rainfall data for the area);

(c) Peak Runoff Flow from a 10-year storm at point of discharge to a treatment facility - m[illegible]

Note: The Rational Formula can be used [illegible] obtain estimates of the above figures.

Rational Formula:

$$Q = CIA$$

where
Q = runoff flow (m^3/s)
C = runoff coefficient ([illegible] page 12 for a rough guide)
I = rainfall intensity (m/s)
A = contributing area (m^2)

.3 The following information on the storm water facilities shall be submitted:

(a) Design of storm water treatment or retention facilities (attach drawings);

(b) Methods and parameters used in the calculation of the design storm runoff;

(c) Description of the methods for minimizing storm water contamination.

Note: Where available, provincial guidelines for the relevant industry category should be consulted to ascertain specific requirements.

.4 (a) Is there any possibility of spilling any raw materials and/or any final products which may cause pollution?

Yes ______ No ______

SAMPLE ONLY

If yes, what are the raw materials and/or final products?

____

____

____

(b) Frequency of spilling ____________________

(c) Is there any pollution control if the ab[illegible]tated spill may occur?

Yes _____ No _____

SAMPLE ONLY

RATIONAL METHOD

C

Table VIII.1 Runoff Coefficients for Urban Areas

Description of Area	Runoff Coefficient
Flat, residential, with about 30% of of area impervious	0.40
Moderately steep, residential, with about 50% of area impervious	0.65
Moderately steep, built up, with about 70% of area impervious	0.80

(Horner and Flynt 1936)

SAMPLE ONLY

Table VIII.2 Deductions from Unity to Obtain the Runoff Coefficient for Agricultural Areas

$C = 1 - (a + b + d)$

Type of Area	Values of C	
Topography		
Flat land, with average slopes of 1 ft. to 3 ft. per mi.	0.30	
Rolling land, with average slopes of 15 ft. to 20 ft. per mi.	0.20	-a
Hilly land, with average slopes of 150 ft. to 250 ft. per mi.	0.10	
Soil		
Tight impervious clay	0.10	
Medium combinations of clay and loam	0.20	-b
Open sandy loam	0.40	
Cover		
Cultivated lands	0.10	
Woodland	0.20	-d

(Bernard 1935)

* In Table VIII.2, the magnitude of C is obtained by adding values of C for each of the three factors: topography, soil and cover, and then by subtracting the sum from unity.

Gray, Donald M., Handbook on the Principles of Hydrology. Water Information Centre, Inc. 1970. Page 8.5

2.9.0 Liquid Effluent Treatment Facilities:

.1 Pretreatment, e.g., screening, grit removal, comminution units, etc.

Yes ______ No ______

If yes, give a full description of the design, handling volume and efficiency (attach drawings):

____

____

____

.2 Primary Treatment, e.g., sedimentation [illegible], clarifier, separator, etc.

Yes ______ No ______

If yes, give a full description of the design, handling volume, retention time, efficiency, etc. (attach drawings): ______________

____

____

____.

.3 Secondary Treatment, e.g., activatee sludge, trickling filters, oxidation [illegible] (biological lagoon), chemical treatment, etc.

Yes ______ No ______

If yes, give a full description of the design, handling volume, retention [illegible], efficiency especially the percent of BOD_5 and total suspended solids reduction (attach drawings): ______________

____

____

____

____

____.

SAMPLE ONLY

.4 Tertiary Treatment, e.g., supplemental sedimentation, nutrient removal, tertiary filtration, ion exchange, etc.

Yes ______ No ______

If yes, give a full desctiption of the design, handling volume, retention time, and efficiency (attach drawings): ____________________

____

____

____

____.

.5 Other Treatments:

Chlorination ______________

Activated carbon ______________

Others ______________

____

.6 How are the solid wastes being disposed, e.g., sludge, garbage, etc? Provide details requested in the Appendix I.

SAMPLE ONLY

.7 Structure of the liquid effluent or cooling water outfall. Give a brief description of the design. ______________________________

____

____

____

____.

SAMPLE ONLY

Section Three: Statements

3.0 The applicant shall discuss the following points:

.1 Describe the different processes or operations that may cause different rates of contamination. Describe and show how they will be different;

.2 Describe the potential for accidents and emergencies and the contingency procedures to minimize the potential damage;

.3 Proposed method and frequency for monitoring waste water, volume flow rates, and concentrations of water contaminants;

.4 A brief statement assessing the impact of the operation or manufacturing process on the surrounding environment.

Section Four

4.0 This application is submitted in accordance with the Clean Water Act, and may require the applicant to submit any additional information considered necessary regarding the proposed water facility.

An application for a Permit or Licence shall not be deemed to be filed until all the information, documents, and authorizations in the application form have been received.

SAMPLE ONLY

____
(Date)

____
(Signature)

____
(Title of Signature)

NOTE: The application must be signed by the owner or his agent.

APPENDIX 1

APPLICATION FORM FOR APPROVAL OF AN INDUSTRIAL LANDFILL

SAMPLE ONLY

THE CLEAN WATER ACT

Application for a Permit or Licence

SAMPLE ONLY

TO: ALL APPLICANTS FOR AN INDUSTRIAL LANDFILL APPROVAL

1. All sections to be completed by applicant.

2. The completed application and attachments are to be sent to:

Director of Standards and Approvals
Standards & Approvals Division
Alberta Environment
4th Floor, Oxbridge Place
9820 - 106 Street
EDMONTON, ALBERTA
[illegible] 2J6

THE CLEAN WATER ACT

APPLICATION FOR APPROVAL OF AN INDUSTRIAL LANDFILL

Application No.: ____________________
Date Received: ____________________
Reviewed by: ________________________

FOR OFFICE USE ONLY

SAMPLE ONLY

Section One: General Information

1.1 Date of application: ____

1.2 Name, address and phone number of applicant: ____________________
____

1.3 Name, address and phone number of owner/operator: ____________________
____

1.4 Legal land description of disposal site: ____________________
____

1.5 Current land use and zoning: ________________________________
____

1.6 Applications for:
A. A permit to construct ______________________________
B. A licence to operate ______________________________

1.7 Summary of project: ____
____
____
____

1.8 Duration of project: ____
____

Section Two: Geographical Features

Scale diagrams of the industrial landfill site and surrounding area are required. These diagrams shall include:

2.1 Topography of the area;

2.2 Landfill boundaries, buffer zones, and land use of the area;

2.3 Location of all water bodies and water supply wells within 500 m radius of the site.

Section Three: Geological Characteristics

The description of the surficial and bedrock geology shall include:

3.1 Classification, hydraulic conductivity, and liquid absorption capacity of the soil;

3.2 Lithologic description and hydraulic characteristics of the geologic formations to a depth of at least 1[illegible] m below ground surface.

Section Four: Hydrogeological Characteristics

The following information shall be included in the description of the local hydrogeology:

4.1 Water table level;

4.2 Ground water flow directions and rates;

4.3 Background quality of ground water in the upper water-bearing strata within the expected zone of influence;

4.4 Present ground water uses which could be affected.

SAMPLE ONLY

Section Five: Design Considerations

A description of types, characteristics and quantities of wastes as well as details on the industrial landfill design shall include:

5.1 Production rate of each waste stream;

5.2 Physical and chemical characteristics of each waste stream;

5.3 Description of disposal methods;

5.4 Detailed landfill design;

5.5 Physical and chemical properties of liners, [illegible] intermediate or final covers;

5.6 Potential of materials described in 5.5 to retard movement and/or provide neutralization of waste components.

SAMPLE ONLY

Section Six: Monitoring System

A full description of the ground water monitoring system for the industrial landfill shall include:

6.1 Proposed number and location of ground water observation wells (as a minimum, one well hydraulically upgradient of the site and two wells downgradient are required);

6.2 Details on the completion of observation wells (depth, screening interval, construction material, casing and annular seals).

Section Seven: Closure and Reclamation

A discussion regarding closure procedures, reclamation of the site, and the planned end use of the land shall be provided.

Section Eight: Local Authority Approval

Provide copy of development permit.

Section Nine:

This application is submitted in accordance with the Clean Water Act and may require the applicant to submit any additional information considered necessary regarding the proposed industrial landfill.

An application for a Permit or Licence shall not be deemed to be complete until all the information, documents and authorizations in the application form have been received.

SAMPLE ONLY

____
(Date)

____
(Signature)

____
(Title of Signature)

NOTE: The application must be signed by the owner or his agent.

FP60

Alberta

FIRE PERMIT (FREE)

ENERGY AND
NATURAL RESOURCES
Forest Service

No. J300031

SAMPLE ONLY

Issued under authority of The Forests and Prairie Protection Act and Regulations thereunder.

THIS PERMIT authorizes ______________________________

of ______________________ (Address). ____________ (Telephone No.).

to kindle fires on the following lands ______________________________

Sec. ________ Twp. ________ Rge. ________ West of ________ Mer. for the purpose of

burning ______________________________.

Burning shall be done in compliance with The Forests and Prairie Protection Act and Regulations made thereunder, and the following conditions: ______________________________

____

____

____

Effective ____________, 19 ______. Expires ____________, 19 ______.

I have read and understand the conditions above and regulations on the reverse side, and accept full responsibility.

______________________________ Permittee ______________________________

Countersigned by

____
(Forest Officer or Fire Guardian)

______________________________, 19 ______.
(Date)

NOTE: This permit is not valid unless countersigned and may be cancelled at any time.

Revised April 1983

(See Over)

EXPLORATION APPLICATION SUPPLEMENT
INITIAL ENVIRONMENTAL INVESTIGATION

SAMPLE ONLY

PROSPECT NAME: ____________________ LOCATION: ______________________

LICENSEE: __________________________ PERMITTEE: ____________________

CONTACT AND/OR
AUTHORIZED AGENT: ________________ PARTY [illegible] ______________________

NO. MILES (KM): ___________________ EQUIPMENT: ______________________

REGION: ____________________________ ENERGY SOURCE: ____________

FOREST: ____________________________ COMMENCEMENT DATE: ________

FMA: _______________________________ COMPLETION DATE: __________

EASTERN SLOPE ZONES: ____________ MAP SHEETS: _______________

OTHER: ______________________________

Initial Environmental Investigation

1. PREPLANNING COMPLETED [illegible] YES NO

   a) REASON FOR NOT USING EXISTING ROUTES WITHIN 0.4 KM OF PROPOSED NEW CUT

   ____

   b) FIELD CONTACT: ( ) AGENCY: ______________________
   NAME: ____

   ____

   ____

   c) MAJOR ENVIRONMENTALLY SENSITIVE AREAS IDENTIFIED: LIST:

   ____

   ____

* d) NUMBER AND TYPE OF WATERCOURSE CROSSINGS PROPOSED AND IDENTIFIED ON PRELIMINARY PLAN

   ____

e) ONSITE INSPECTION YES NO

** f) PHOTOGRAPHS WITH APPLICATION YES NO

2. METHODS OF OPERATION PROPOSED IN ENVIRONMENTALLY SENSITIVE AREAS IDENTIFIED UNDER 1(c):

____

____

3. TYPE OF RECLAMATION TO BE CARRIED OUT AND TIME FRAME: ______________

____

4. EXPLANATION OF OPERATIONAL METHODS AND TECHNIQUES TO BE USED DURING FIELD OPERATIONS: ______________________

____

____

____

____

____

____

SAMPLE ONLY

---

* Primary concern is with fish bearing streams, however other considerations must be addressed such as unstable banks, potential siltation which could affect water quality.

** Photographs recommended to facilitate the assessment and evaluation of program applications.

LAND DISPOSITION APPLICATION SUPPLEMENT
INITIAL ENVIRONMENTAL INVESTIGATION

1-51(80-09)

Land Disposition App. No. ____________________

Location: ______________________________ Region (E&NR) ______________________________

Estimated Date of Commencement: ____________ Estimated Date of Completion: ____________

Construction Days: ______________________ Drilling Days: ______________________

Is standard type of equipment being used: Yes No (If NO, explain)

Sources of Information:
Field Scouting ☐ Air Photo Inspection ☐ Topographic Map ☐ Literature Review ☐

Contact With: Government (Agencies ____________ Individual ____________)
Occupant ☐ Trapline Licenses ☐ Other (specify) ☐

Comments:

Major Environmental Sensitivities:
Air & Noise ☐ Vegetation ☐ Soil ☐ Wildlife Aesthetics ☐
Social ☐ Archaeological ☐ Hazardous Materials ☐
Existing Activity ☐ Water ☐ Fisheries ☐ None ☐

Comments:

SAMPLE ONLY

SURFACE PREPARATION

1. Does this development affect any special land use zones/areas? Yes No
   Comments:

2. Species of predominant forest cover to be removed: Spruce ☐ Pine ☐ Poplar ☐ Mixed ☐ Muskeg ☐
   Average diameter and height ______________________________
   Density: Sparse ____________ Medium ____________ Heavy ____________

3. Is top soil to be stripped and piled to one side: __________ (If answer is NO explain)

4. Will any part of the surface lease or linear development be closer than 90m to any waterbody or watercourse? ____________ (If answer is YES describe)

5. Will any part of the surface lease or linear development be closer than 90m to the top of a coulee, water well, park, open meadows greater than 1 hectare, residence or other surface improvements? ____________ (If answer is YES describe)

6. Will borrow pits for fill be required? Yes No (If YES, show location on plan)

7. Will sand and gravel be required? Yes No (If YES, indicate source or show location on plan)

Complete Page 2(a) and/or 2(b)

SAMPLE ONLY

SITE DEVELOPMENTS (wellsites, batteries, plants, stations, camps, sumps)

General

1. Soil type (sand, gravel, clay, bedrock, muskeg or other) ______________________

2. Site Plan:
   Location of the site must be plotted on NTS map of 1:50,000 scale or larger. It should also be plotted on an aerial photograph of similar scale. Location of associated access must be identified per 2(b).

3. Is surface run-off diversion required or planned ______________ (If NO, explain)

4. Will the site be diked? ________________ (If NO, explain)

5. Is cut/fill on lease greater than 3m? ________________ ([illegible] YES explain)

6. Will prevailing winds affect site location? [illegible] (If YES, elaborate)

7. Source of water (indicate location to [illegible] use[illegible] [illegible] site plan).

Wellsites

1. If location is environmentally unacceptable, is directional drilling feasible as an alternative? (Yes[illegible]) ____________ (If NO, explain)

2. Describe drilling fluids control and disposal program.
   (a) Sump [illegible]
       Tanks
       O[illegible]e
       On [illegible]
   ([illegible]) [illegible] capacity be less than 6000 BBLS? ____________ (If NO, explain)

   (c) Is sump liner anticipated to prevent seepage? Yes No (If YES, explain)

   (d) Will sump be located on high side of lease and be located 90m from waterbodies and/or watercourses? Yes No (If NO, explain)

   (e) Can rig wash water be [illegible] separate from drilling fluids? Yes No
       (If NO, explain)

3. H_2S possibility? Yes No Is there a contingency plan in place? Yes No

Access

1. Is access part of the application for site development? Yes No
   (If YES, answers to questions in 2(b) under Roads must be answered)

LINEAR DEVELOPMENTS

General (Roads, Pipelines)

1. Are there any existing cleared routes (seismic lines, roadways, etc.) that will be used? Yes No (If YES, indicate location on plan) (If NO, explain)

2. Plan of proposal development must be presented on NTS map of 1:50,000 scale or larger. It should be accompanied by a strip photo mosaic of similar scale.

3. Plan should show location of any associate site facilities (camps, off-loading sites, helicopter landing sites, airstrips, etc.).

4. Can variable width clearing be employed? Yes No (If NO, explain).

Roads

1. Type (Purpose)
   Typical Cross-Section: (complete sketch on back of this page)
   Must include:
     R/W width
     Road surface width (crown)
     Backslopes and sideslopes (typical ratios)
     Type of ditch (V, scraper, rounded)
     Location of other facilities in same R/W
     If any not applicable, please explain.

2. Plan:
   Plan must show: (1:50,000 NTS)
     Proposed route location
     Stream crossings
     - location
     - type (ford, bridge, culvert)
     - size
     Unstable areas affecting road location.

3. Describe details of:
     Grades ____________________ (Maximum)
     Will excessive cuts and fills (greater than 2M) be required? Yes No
     (If YES, explain)

SAMPLE ONLY

Pipelines

1. Pipeline Diameter(s) ______________________
   Length(s) ______________________
   Purpose: Collection or Transmission:
   Type of Materials Transported: ______________________________
   Typical Cross-Section: (Complete sketch on back of this page)
     Must include:
     Width of Legal R/W
     Width of area to be disturbed
     Width of permanent R/W required for maintenance
     Location of other facilities in same R/W
     Quote PLA application numbers.

2. Plan:
     Proposed access locations
     Streamcrossings (vehicular access)
     - location
     - type (ford, bridge, culvert)
     - size
     Unstable ground affecting pipeline location.

3. Describe details of:
     Grading
     Stream Crossing Techniques for Protection of Fisheries and Water Quality.

SAMPLE ONLY

Operational Reclamation

1. Are there any disturbed areas relative to the application that cannot be recontoured? Yes No (If YES, explain)

2. Will mud, sump fluids, or pipeline test fluids be disposed on the lease? ____________
(If NO, explain) (If YES, describe methods).

3. Will top soil be placed on all disturbed areas? ________________ (If NO, explain).

4. Describe brush disposal, revegetation, gravelling, erosion control and long term vegetation management measures to be taken on the [illegible] road [illegible] pipeline right-of-way and on the lease.

5. Will reclamation work be undertaken progre[illegible] will it be completed within 90 days of disturbance? ________ (If ans[illegible], explain).

Abandonment Reclamation: [illegible] any disturbed areas that cannot be recontoured?
[illegible]es (If YES, explain).

Leases: Describe briefly reclamation and restoration procedures including revegetation and [illegible]ion [illegible] measures.

Roads and [illegible]ines: Describe briefly reclamation measures including removal of culverts and bridges, cross ditching, erosion control and revegetation.

Name, Address and Phone Number of Company Representative(s) responsible for this application.

Name: ______________________________ Phone Number: ______________
Address: ______________________________
____
____
______________________________ Title: ______________

Name: ______________________________ Phone Number: ______________
Address: ______________________________
____
____
______________________________ Title: ______________

PERMIT TO CONDUCT GEOPHYSICAL OPERATIONS

Form #3

COMPANY NAME ________________ PAGE ______ OF ______

ADDRESS ________________ TELEPHONE ________________

HEAD OFFICE CONTACT ________________ PROJECT NAME/NO ________________

EXPLORATION PERMIT NO ________________ PARTY NO ________________

LINE NO ________ OTHER LINES PERMITTED ________________

I ________________ of ________________
(PRINT NAME) (FULL ADDRESS)

(hereinafter called the "Grantor" being the owner ☐ Agent ☐ or in possession of the lands ☐ described as

(OWNED) (RENTED) (LEASED) ________ SEC ________ TWP ________ RGE ________ W ________ M

(OWNED) (RENTED) (LEASED) ________ SEC ________ TWP ________ RGE ________ W ________ M

(OWNED) (RENTED) (LEASED) ________ SEC ________ TWP ________ RGE ________ W ________ M

in the Province of ALBERTA, in consideration of

________________ /mile Right of Entry Fee ________________

________________ /recorded mile Permit Fee ________________ /Fence Cut Repair

Total $ ________________ /recorded mile Damages will be comp[illegible]ated at fair market value

The Grantor hereby agrees to permit the personnel and equipment of the above-named compa[illegible]d its subcontractors [illegible]ereinafter collectively called "Grantee") to enter upon the lands described above for the purpose of conducting al[illegible] a single geophysical operation thereon. These monies shall be for Right of Entry and not for damages beyond normal wear and tear re[illegible]ng fr[illegible] ope[illegible]. Payment for Right of Entry shall be made within 90 (ninety) days following the completion of the Geophysical operation[illegible]ore, the Grantor and Grantee hereby covenant and agree to the following terms and conditions

1. The Grantee shall compensate the Grantor for all damages over and above normal w[illegible]curred as a result of the operation of the Grantee
2. "Grantee shall conduct all operations in a careful, diligent and workm[illegible] strict compliance with all applicable laws, regulations, and orders of duly constituted authorities, provided further t[illegible] Grantee [illegible] not [illegible] a shot hole within 600 feet (180 meters) of any water well
3. "Grantee" shall indemnify and save Grantor harmless from and against all ac[illegible] suits [illegible]ms and demands whatsoever by any person, firm or corporation arising out of or resulting from any acts or ommi[illegible]ons of Grant[illegible] of its operations, and for any loss, damages, cost and expense to Grantor in respect of such operations
4. In the event the Grantee does not enter the lands perm[illegible] the Grantee shall not be obligated to make any payment to the Grantor
5. It shall be the responsibility of the Grantor to accomp[illegible] G[illegible] to inspect the above-described lands, upon the completion of the operations, to establish and agree to the amount of compe[illegible] A sig[illegible] release will be required from the Grantor before any damage payment will be made by the Grantee
6. The Grantor grants a working area as shown o[illegible] sketch belo[illegible]ched. All operations shall take place in a working area approx ________ ft (________ metres[illegible]
7. This permit is in effect from DATE SH[illegible] BELOW to ________________
8. Any additional terms, expressed or impl[illegible] shall [illegible] no for[illegible] effect unless made in writing and agreed to by the Grantor and Grantee as stated below or on the attached p[illegible]

____

____

____

____

________________ Res. Location ________________

In order to assi[illegible] the cr[illegible]entif[illegible]ng various obstacles, please check and indicate on this sketch (or attachment) by symbol, if any of the following are o[illegible]be[illegible] lands or adjacent to them. (Should be drawn as close to scale as practical)

☐ Buildings (B)
☐ Pipelines (P)
☐ Oil Wells (OW)
☐ Sloughs (SL)
☐ Other (describe)
☐ Water Wells (W)
☐ Springs (SP)
☐ Gas Wells (GW)
☐ Gates (G)
☐ Stock (S)
☐ Crops (C)
☐ Trees (T)
☐ Fences (F)

Signature ________________
(GRANTEE-COMPANY'S AGENT)

________________ Telephone ________________
(PRINTED NAME)

Signature (Grantor) X ________________

Date ________________ Telephone ________________

As the Lessee, Renter, Agent of the above described lands, I do hereby declare that I have legal authority, or the consent of the lessor (owner), to sign this permit form and receive payment of permit fees or damage settlements, of which all, or part of, may be payable to the lessor (owner) And further do hereby understand the above statement

____
(SIGNATURE OF LESSEE RENTER AGENT)

Please read the pamphlet titled "Seismic Operations and Farmers Rights" attached to this Permit Form prior to signing. Failure to deliver this pamphlet does not invalidate this Permit Form

Acknowledged by ________________

SAMPLE ONLY

ERCB Energy Resources Conservation Board
640 Fifth Avenue SW
Calgary, Alta T2P 3G4

Application for a Well Licence

SAMPLE ONLY

1

THIS APPLICATION FOR A WELL LICENCE IS MADE UNDER SECTION ☐ 2 020 ☐ 2 030 ☐ 2 040 OF THE OIL AND GAS CONSERVATION REGULATIONS.

THE PURPOSE OF THE PROPOSED WELL WILL BE TO ____

____.

2 **LOCATION AND DEPTH**

SURFACE LOCATION OF THE WELL IS IN LSD ______________ W____ M	PROJECTED BOTTOM-HOLE LOCATION IS 1 ☐ THE SAME AS THE SURFACE OR 2 ☐ IN LSD ______________ W____ M
THE SURFACE CO-ORDINATES AS MEASURED FROM THE EXTERIOR BOUNDARIES OF THE QUARTER SECTION CONTAINING THE WELL ARE _ _ _ . _ METRES 1 ☐ NORTH 2 ☐ SOUTH _ _ _ . _ METRES 1 ☐ EAST 2 ☐ WEST	PROJECTED TOTAL DEPTH (Measured - Not TVD) ______________ METRES

THE WELL WILL BE ON TARGET FOR OIL 1 ☐ YES 2 ☐ NO 3 ☐ N/A LEGAL DESCRIPTION OF OIL DSU ______________.
GAS 1 ☐ YES 2 ☐ NO 3 ☐ N/A LEGAL DESCRIPTION OF GAS DSU ______________.

THE WELL WILL TERMINATE 1 ☐ IN THE ______________ ☐ NOT MORE THAN ______ METRES
BELOW THE BASE OF THE ______________. 3 ☐ NOT MORE THAN ______ ME[illegible]O THE ______________.

THE WELL WILL BE DRILLED 1 ☐ CONVENTIONALLY 2 ☐ DIRECTIONALLY 3 ☐ (OTHER) ______________.

SURVEY COMPANY	DATE OF ATTACHED SURVEY PL	GROUND ELEVATION _ _ _ _ . _ METRES
REQUESTED WELL NAME	DRILLING CO	ANTICIPATED SPUD DATE

3 **BOA[illegible] ONLY**

BOARD ASSIGNED WELL NAME		UI 1__ __/__ __-__ __-__ __ __-__ __W__/__ __
SPACING ORDER	GAS DSU	OIL DSU
APPLICATION CORRECT ☐ YES ☐ NO	GAS TARGET	OIL TARGET

LAHEE	EXPLORATORY BE	F FORM CODE	INCENTIVE CERT NO	TERM FORM CODE

4 **CASING PROGRAM**

CASING TYPE	INTERVAL DEPTH (m) BOTTOM JOINT TO TOP J	IZE	LINEAR DENSITY (kg/m)	GRADE	COLLAR TYPE	NEW USED OR IN HOLE	TRUE VERTICAL DEPTH OF BOTTOM JOINT

5 **[illegible]AL RIGHTS**

1 ☐ THE APPLICANT HAS THE RIGHT TO PRODUCE AS INDICATED BELOW
2 ☐ MINERAL RIGHTS ARE NOT APPLICABLE TO THE PURPOSE OF THIS WELL.

1 ☐ FROM ALL FORMATIONS DOWN TO AND INCLUDING TERMINATING FORMATION.
1 ☐ IN ALL OF SECTION ______________.
2 ☐ FROM ALL FORMATIONS BELOW THE BASE OF THE ______________.
2 ☐ IN ______________
3 ☐ FROM THE ______________.
OF SECTION ______________.

THE HEADLESSORS ARE 1 ☐ ALBERTA CROWN 2 ☐ FREEHOLD 3 ☐ ALBERTA CROWN/FREEHOLD COMBINED
4 ☐ OTHER ______________.

AGREEMENT TYPE(S) ______________ NO(S) ______________ EXPIRY DATE(S) ______________.

6

DATE	AMOUNT RECEIVED	BY	RECEIPT NO

ED1-85-3

PAGE TWO OF APPLICATION FOR ______________________________
(WELL NAME)

7 IF THE RESPONSE TO ANY OF THE FOLLOWING STATEMENTS IS "NO" ADDITIONAL INFORMATION IS REQUIRED (SEE GUIDE).

SURFACE I T

	YES	NO
THE PROPOSED WELL IS AT LEAST 1.5 km FROM THE CORPORATE LIMITS OF A CITY, TOWN, OR VILLAGE.	☐	☐
THE PROPOSED WELL IS OUTSIDE ANY POTENTIAL COAL DEVELOPMENT AREA.	☐	☐
THE PROPOSED WELL IS AT LEAST 100 m FROM THE NORMAL HIGH WATER MARK OF ANY SIGNIFICANT WATER BODIES.	☐	☐
THE PROPOSED WELL IS AT LEAST 100 m FROM ANY SURFACE IMPROVEMENTS AND AT LEAST 40 m FROM ANY SURVEYED ROAD.	☐	☐
THE PROPOSED WELL IS AT LEAST 5.0 km FROM A LICENSED AIRPORT LISTED IN PART A OF SCHEDULE 3 OIL & GAS CON REGS.	☐	☐
THE PROPOSED WELL IS AT LEAST 1.6 km FROM A LICENSED AIRPORT LISTED IN PART B OF SCHEDULE 3 OIL & GAS CON REGS.	☐	☐
THE PROPOSED WELL IS EXPECTED TO ENCOUNTER ONLY HYDROCARBONS THAT ARE ESSENTIALLY FREE OF H_2S.	☐	☐

8 SURFACE RIGHTS

THE SURFACE OF THE LAND TO BE USED BY THE APPLICANT IS OWNED BY 1 ☐ THE ALBERTA CROWN 2 ☐ SEE BELOW 3 ☐ SEE ATTACHED LIST

WITH RESPECT TO THE RIGHT OF ACCESS TO THE LAND SURFACE THE APPLICANT 1 ☐ HAS 2 ☐ HAS APPLIED FOR 3 ☐ WILL BE APPLYING FOR

1 ☐ A SURFACE LEASE DATED ____________________. 2 ☐ A LICENCE OF OCCUPATION. 3 ☐ A MINERAL SURFACE LEASE.

4 ☐ A RIGHT OF ENTRY ORDER. 5 ☐ (OTHER) ______________________________.

SURFACE OWNER(S) ____________________ MAILING ADDRESS ____________________

CITY ____________ PROVINCE ____________ POSTAL CODE ____________ TEL ____________

THE SURFACE OWNER(S) AGREE(S) TO THE LOCATION OF THE WELL SITE AND ACCESS ROAD. ☐ YES ☐ NO

THE INFORMATION PACKAGE WAS RECEIVED BY THE SURFACE OWNER(S) ON ______________________________.

1 ☐ THERE ARE NO OCCUPANTS OF THE LAND OTHER THAN THE SURFACE OWNER(S) 2 ☐ SEE BELOW 3 ☐ SEE ATTACHED LIST

SURFACE OCCUPANT(S) ____________________ MAILING ADDRESS ____________________

CITY ____________ PROVINCE ____________ POSTAL CODE ____________ TEL ____________

THE SURFACE OCCUPANT(S) AGREE(S) TO THE LOCATION OF THE WELL SITE AND ACCESS ROAD. ☐ YES ☐ NO

THE INFORMATION PACKAGE WAS RECEIVED BY THE SURFACE OCCUPANT(S) ON ______________________________.

9 AUTHORITY

APPLICANT ____________________ MAILING ADDRESS ____________________

CITY ____________ PROVINCE ____________ POSTAL CODE ____________

AGENT ____________________ MAILING ADDRESS ____________________

CITY ____________ PROVINCE ____________ POSTAL CODE ____________

THE APPOINTMENT OF ABOVE AGENT HAS BEEN REGISTERED WITH THE BOARD (SEC 83(1) OIL & GAS CONS ACT) ☐ YES ☐ NO

THIS APPLICATION DATED AT ____________ THIS ________ DAY OF ____________.

SIGNATURE ____________ TITLE ____________ TELEPHONE ____________

NAME (PRINT) ____________ COMPANY ____________

FOR ADDITIONAL INFORMATION CONTACT ____________________ TELEPHONE ____________

SAMPLE ONLY

10 D USE ONLY

AGENT ABBREV	CODE	APPLICANT ABBREV	CODE	AREA OFFICE	CODE
POOL IN ADJACENT				FIELD NAME	CODE
SURFACE CASING ADEQUATE ☐ YES ☐ NO				LICENCE NO	
ONLY WELL IN DSU ☐ YES ☐ NO	EX SCHEME APPROVAL NO		EXPIRY DATE	OIL SANDS AREA	CODE

PROVISIONS

PROCESSED BY	CHECKED BY	APPROVED BY

ENERGY RESOURCES CONSERVATION BOARD

640 - 5 th AVE. S.W., CALGARY, ALBERTA

APPLICATION FOR LICENCE TO DRILL

SAMPLE ONLY

☐ OIL SAND EVALUATION WELLS
☐ TEST HOLES
☐ EXPERIMENTAL WELLS

(SECTION 102 OIL AND GAS CONSERVATION REGULATIONS)
INSTRUCTIONS: Submit in duplicate with licence fee payable to the Board

Application is hereby made for a licence under Section 2.030 of the Oil and Gas Conservation Regulations for

Name of Program

Location
Twp(s) .... Rge(s) .... w Mer

Number of Wells

These wells shall not be drilled beyond the

Approximate Total Depth

Lessor(s) (Unless test holes)
☐ CROWN (Alberta) ☐ OTHER (Specify)

Lands and Formations in which Applicant Has The Right To Drill For Oil and/or Gas

Type and No. of Reservation Lease etc.

PROPOSED CASING AND CEMENTING PROGRAM

String No.	Casing Size	Linear Density	Grade	Coupling Type	New or Used	Depth Interval From	To	Estimated Cemented Interval For Each String

PROPOSED ABANDONMENT PROGRAM (If Applicable)

Applicant (Company or Individual)

1 Address

This application dated at .... this .... day of .... 19........

(Signature) ....
Name ....
Title or Office ....
Company ....

Appointed Agent
(Section 105 Act) ....
2 Address of Agent ☐ or Representative ☐

Telephone

Licence to be sent to 1☐ 2☐
Other

Duplicate to be sent to 1 ☐ 2 ☐
Other

Drilling Contractor
....
First Spud Date

FOR BOARD USE ONLY

Receipt No. ....
Amount of Fee Rec'd. ....
Initials ....

APPROVED
....
Name .... Title ....

ED-6-80-11

ERCB Energy Resources Conservation Board
640 Fifth Avenue SW
Calgary Alta T2P 3G4

APPLICATION TO REPORT PRODUCTION

(APPENDIX TO BATTERY OR GROUP APPROVAL)

BOARD USE ONLY

YR ___ MO ___ DA ___ DEVELOPMENT DEPT

NEW APPROVAL NO. ___

YR ___ MO ___ ACCT'G PROCESS DATE ___ INITIAL ___

SAMPLE ONLY

SUBMIT ONE COPY TO CALGARY OFFICE c/o DEVELOPMENT DEPARTMENT. BATTERY AND WELL NAMES MUST COMPLY WITH SECTIONS 13.020 & 13.030 OF THE REGULATIONS. MARK APPROPRIATE ☐ WITH AN X.

BATTERY NAME	BATTERY LOCATION	FIELD OR AREA NAME

APPLICATION IS MADE TO KEEP RECORDS AND FILE REPORTS COMMENCING ____________, 19____

- ☐ A SINGLE WELL GAS BATTERY ☐ PERMANENT ☐ TEST
- ☐ A GAS GROUP—MEASURED PRODUCTION AT ALL WELLS
- ☐ A GAS PRORATION BATTERY—S.E. ALTA. ONLY—I.L. 75-13
- ☐ A GAS PRORATION BATTERY—EFFLUENT MEASUREMENT AT EACH WELL
- ☐ A SINGLE WELL OIL BATTERY— ☐ PERMANENT ☐ TEMPORARY
- ☐ AN OIL PRORATION BATTERY
- ☐ A FIELDGATE/SATELLITE BATTERY
- ☐ AN OIL EXPERIMENTAL SCHEME
- ☐ OTHER (SPECIFY BELOW)

____

ERCB ISSUED		
OPER	FIELD	BATTERY

____________ APPROVAL NUMBER

APPLICATION IS MADE TO AMEND A BATTERY OR GROUP COMMENCING ____________, 19____

- ☐ BY ADDITION OF LISTED WELLS ☐ BY CHANGING THE OPERATOR
- ☐ BY DELETION OF LISTED WELLS ☐ BY CHANGING NAME OR LOCATION
- ☐ BY TRANSFERRING WELLS TO NEW BATTERY ☐ OTHER (SPECIFY BELOW)

____

PRESENT BATTERY OR GROUP NAME

LOCATION ____________________

OPER ________
FIELD ________
BATTERY ________

NEW BATTERY OR GROUP NAME

LOCATION ____________________

OPER ________
FIELD ________
BATTERY ________

THE UNDERSIGNED FURTHER CERTIFIES THAT

the information given herein is correct and that the applicant is either licensee or appointed agent, as set out in section 83 of the Oil and Gas Conservation Act for each of the above wells and that no common flow lines will be used for the wells producing to the battery without written approval of the E R C B.

SIGNED		TITLE		
COMPANY	REPORTING OPERATOR CODE	YR	MO	DA
		TELEPHONE NO		

WELL NAME	IDENTIFIER							SATELLITE LOCATION	PRODUCING POOL	MONTHLY TEST FREQUENCY
	LOC EX	LS	SEC	TWP	RGE	MER	ES			

S-7-85-01

ENERGY RESOURCES CONSERVATION BOARD
ALBERTA, CANADA

APPROVAL NUMBER

APPROVAL FOR CONSTRUCTION AND OPERATION OF A BATTERY OR GROUP

pproval is hereby granted to ______________________________ for the

construction and operation of ______________________________

as described in a letter of application dated ______________________________

LOCATION	COORDINATES FROM EXTERIOR BOUNDARIES OF QUARTER SECTION
W MER.	METRES AND METRES

FIELD OR AREA	BOARD AREA OFFICE

This approval is issued subject to the terms and conditions herein contained.

SAMPLE ONLY

ED-9-81-10

ENERGY RESOURCES CONSERVATION BOARD
PROVINCE OF ALBERTA

Application For a Production Spacing Unit Order

1. APPLICATION IS MADE TO: ☐ ESTABLISH ☐ TERMINATE A PRODUCTION SPACING UNIT

2. APPLICATION IS MADE TO VARY A PRODUCTION SPACING UNIT:

☐ BY THE ADDITION OF DRILLING SPACING UNITS ☐ BY CHANGING THE PRODUCING WELL ☐ OTHER (Specify)

☐ BY THE DELETION OF DRILLING SPACING UNITS ☐ BY CHANGING THE OPERATOR

Field or Area Name

Pool Name

Present Production Spacing Unit Approval Number

Unique Well Identifier of Present Producing Well

Unique Well Identifier of Proposed Pr[illegible]ing Well

Lessor of New PSU

Lessee of New PSU

Present Operator

New Opera[illegible]

SAMPLE ONLY

PRODUCTION DATA OF WELLS VALIDATING THE AREA OF [illegible] PR[illegible]DUCTION SPACING UNIT

UNIQUE WELL IDENTIFIER	P[illegible]ATA						
	LATEST TWO MONTHS PRODUCED		MONTHLY [illegible] PRODUCTIO[illegible] m³	AVE[illegible]	AVERAGE MONTHLY GOR	AVERAGE MONTHLY WOR	CUMULATIVE OIL PRODUCTION m³
	Year	Month					

Supporting production data for each well in the proposed PSU shall be submitted as an attachment to this application form using the Board Production Data Form O-33. Evidence required pursuant to section 5.070 of the Oil and Gas Conservation Regulations should be submitted as an attachment to this application form.

THE UNDERSIGNED CERTIFIES

The information given herein is correct and that the Lessor's interests are the same and that the Lessee's interests are the same throughout the proposed production spacing unit or that an agreement of all owners to form the PSU applied for is in full force and effect.

SIGNED ______________________ TITLE ______________________

DATE ______________________ COMPANY ______________________

BOARD ORDER

CHECKED ______________________

DATE ______________________

The PSU comprising the area and having the total maximum allowance set out in the attached Appendix to PSU Form 360 is hereby ordered.

ENERGY RESOURCES CONSERVATION BOARD

PER ______________________

TITLE ______________________

ORDER NUMBER

FIELD	POOL	POOL TYPE	BLOCK	PSU

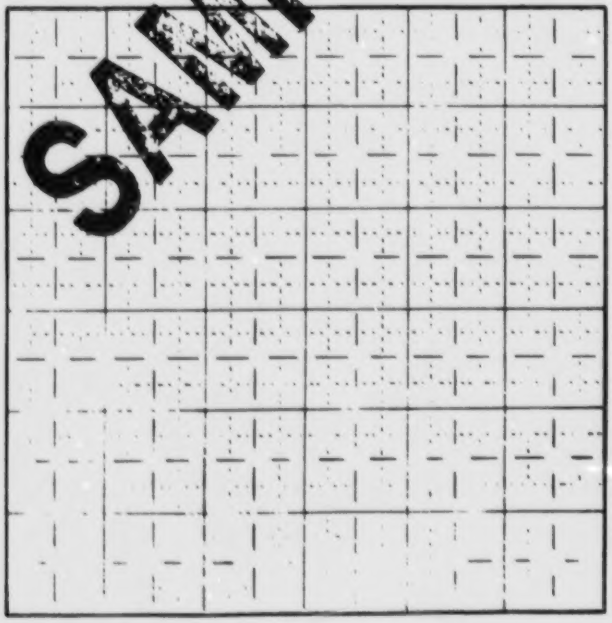
O-41-78-09

SUBMIT IN DUPLICATE

DESCRIPTION OF PRODUCTION SPACING UNIT				
WELL NAME	LEGAL DESCRIPTION OF DSU's IN PROPOSED PSU	NOMINAL AREA HECTARES	OFF-TARGET PENALTY FACTOR	PRODUCTION ALLOWABLE AREA-HECTARES
PRODUCING WELL				
CAPABLE SURPLUS AND OTHER WELLS				
TOTAL AREA				

PRODUCTION SPACING UNIT PENALTY FACTOR $\frac{\text{PRODUCTION ALLOWABLE AREA}}{\text{NOMINAL AREA}}$ ______

SAMPLE ONLY



WELL STATUS LEGEND

1 LOCATION ________ ○
2 DRILLING OR W/O COMPLETION ________ ⦶
3 PRODUCING ________ ◉
4 CAPABLE SURPLUS ________ ●
5 WATER DISPOSAL ________ ⏀
6 WATER INJECTION ________ ⧫
7 GAS INJECTION ________ ✦
8 APPROVED OBSERVATION ________ ▣
9 GAS ________ ✹
10 CAPPED GAS ________ ☼
11 ABANDONED ________ ◆
12 SUSPENDED ________ ⦶
13 MULTI-ZONE COMPLETION ________ ◒

NOTE: If drafting facilities not available use numbers

INDICATE:

1 Location and status of each well affecting this application (see legend)
2 Area to be added or deleted by shading and note which category applies

ERCB
Energy Resources
Conservation Board
640 Fifth Avenue SW
Calgary, Alta T2P 3G4

NOTICE OF COMMENCEMENT OR SUSPENSION OF PRODUCTION OR INJECTION AT A WELL

(Shaded Areas For Board Use Only)

Well Name

Unique Well Identifier: le lsd sec twp rge W M p es
1 W
1 W

Licence Number

Field /Oil Sands Area Name

Code

Pool /Deposit Name *

Code

Show zone if no Pool / Deposit designated
*For commingled pools state both pool names

Previous Status

Gross perforated interval ____________ To ____________

Producing to a single well battery ☐ Yes ☐ No

Present Status

Fluid

☐ Oil ☐ Flow ☐ Pump ☐ Gas Lift ☐ 0-38 Required [illegible] forwarded ___ ___ ___ Y M D
☐ Bitumen (Within Oil Sands Area) ☐ Flow ☐ Pump ☐ G[illegible] Lift
☐ Gas Liquid Is ☐ Oil or ☐ Condensate De[illegible] kg/m³ ____________
☐ Water
☐ Other (specify) ____________

Mode

☐ Potential ___ ___ ___ Y M D
☐ Commencement Of Operations ___ ___ ___ Y M D
☐ Testing (Gas Only) ___ ___ ___ Y M D To ___ ___ ___ Y M D
☐ Resu[illegible]ption Of Operations ___ ___ ___ Y M D
☐ [illegible]pension ___ ___ ___ Y M D
☐ Other ____________ ___ ___ ___ Y M D

Type

☐ Producing ☐ Disposal
☐ Injection ☐ Othe[illegible] ____________

Board Approval No. ____________

H_2S Content

☐ Sweet
☐ Sour ______ H_2[illegible]

If Gas Well A.O.F.P. Rate ____________ $10^3 m^3/d$

Comments ____________

Operator Or Agent ____________

Address ____________

Signature ____________

Name (Print) ____________

Title ____________

Contact ____________

Phone No. ____________

Date ___ ___ ___ Y M D

Microfilm	Well Records	Oil	Gas	Development	Microfilm	Well Records	

THIS FORM MUST BE COMPLETED IN ACCORDANCE WITH INSTRUCTIONS SPECIFIED IN THE BOARD'S PRODUCTION ACCOUNTING HANDBOOK TO BE FILED WITH THE BOARD'S HEAD OFFICE (640-5 AVE. S.W. CALGARY ALBERTA T2P3G4) WITHIN FOURTEEN DAYS OF THE OCCURRENCE OF THE ABOVE OPERATIONS
(INSTRUCTIONS ON REVERSE)

S-4-86-07

SAMPLE ONLY

Name and address of operator

MONTHLY WATER DISPOSAL OR INJECTION SYSTEM STATEMENT

ENERGY RESOURCES CONSERVATION BOARD

WATER VOLUMES in m^3 @ 101 325 kPa and 15° C (PRECISION 0.0)

YR	MO	OPER	FIELD	SYSTEM	PAGE

Name of disp or inj system ____________________

DETAILS OF RECEIPTS / DETAILS OF DISPOSITION NOT INJECTED

15

SURFACE WATER IDENTIFIER							CODES				WATER VOLUMES					OTHER DISPOSITION		
LE	LS	SEC	TWP	RGE	M	ES	OPER	BTY/DSP	FIELD	9	BATTERY A	9	SURFACE B	NAME/IDENTITY (OTHER)	OTHER C	NAME/IDENTITY	VOLUME D	
										9		9						1
										9		9						2
										9		9						3
										9		9						4
										9		9						5
										9		9						6
										9		9						7
										9		9						8
										9		9						9
										9		9						10
										9		9						11
										9		9						12

DETAILS OF WATER DISPOSED OR INJECTED BY WELL

16

UNIQUE WELL IDENTIFIER														CODES	
LE	LS	SEC	TWP	RGE	M	ES	HOURS INJ	OPERATING WELLHEAD PRESSURE (GAUGE)	TOTAL VOLUME INJECTED E	TYPE OF INJECTION 1-BTY/OTHER 2-SURFACE 3-BOTH	FORMATION PACKER YES/NO	MAXIMUM ANNULUS PRESSURE (GAUGE)	WELL NAME	FIELD	POOL

16

OPENING INVENTORY F	RECEIPTS				CLOSING INVENTORY J	DISPOSITION				
	BATTERY G	9	SURFACE H	OTHER I		TOTAL AVAILABLE FOR DISPOSAL INJECTION K	9	LOSSES & ADJUSTMENTS L	OTHER DISPOSITION M	INJECTED N
		9					9			

SIGNED ____________________ TITLE ____________________ TELEPHONE NO ____________________ DATE ____________________

S-18-79-01

SAMPLE ONLY

See Instructions on reverse side.

ERCB **Energy Resources Conservation Board**
640 Fifth Avenue SW
Calgary, Alberta T2P 3G4

☐ **APPLICATION TO:** ☐ **ABANDON A WELL** ☐ **PLUG BACK A WELL** ☐ **RESUME DRILLING** ☐ **TEMPORARILY ABANDON A ZONE**
☐ **APPROVAL TO:** ☐ **ABANDON A ZONE** ☐ **RE-ENTER A WELL** ☐ **SUSPEND DRILLING** ☐ ____________

ERCB CODE USE

Well Name

Unique Well Identifier: LE | LS | SC | TWP | RG | W | M | E

Licence Number

ERCB Area Office

Company Representative

Phone

Log Markers	Depth (m)	Porous or Perf. Intervals (m)

Data	Depth (m)	Casing Size (mm)	Hole Size (mm)
KB			
Casing SFC			
Inter			
Prod			
Total Depth		PB	

Program of Operations

ERCB Authorized Abandonment Program

Plug No. ____ May Be Staged and ____ Stage Felt

Cement Plug	Interval (m)		Feel After 8 hours
1 ______	To	______	______
2 ______	To	______	______
______	To	______	______
______	To	______	______
5 ______	To	______	______
______		______	______
______	To	______	______
8 ______	To	______	______

Condition[illegible] program as [illegible] the reverse side [illegible] follows:

No.(s) ____________

Program Authorization

On YR | MO | DY

By ____________
Name (Typed)

____
Signature

____
Office

Program Approval

On YR | MO | DY

By ____________

Summary Report of Abandonment Program Followed

Volume of Cement and Additives	Bottom of Pipe Set at (m)	Plug Felt – (If logged, attach logs)			
		Depth (m)	Mass (daN)	Date	Time

Was either condition 2 or 3 (described on reverse side) completed? ☐ Yes ☐ No

Reason for Abandonment

☐ It is no longer commercially productive of oil or gas.

☐ Testing and logging failed to disclose evidence of commercially recoverable hydrocarbons.

☐ It was necessary to abandon for safety or mechanical reasons.

Certification

☐ The Licensee (Agent) hereby certifies that the abandonment was carried out for the reason(s) indicated and in accordance with the program authorized by the ERCB as shown in the summary report.

☐ The Licensee (Agent) hereby certifies that the program of operations will be carried out for the reason(s) indicated.

Signature ____________ Title ____________

Company ____________ Date ____________

ED 21 83 06

SAMPLE ONLY

ERCB

Energy Resources
Conservation Board
[illegible] Fifth Avenue SW
[illegible] Alta T2P 3G4

PIPELINE APPLICATION
PERMIT - LICENCE

PAGE ____ OF ________

FILE NO	| | – | | |
APPROVAL NO	
AMEND I.D.	
ACD	

☐ APPLICATION FOR PERMIT

☐ APPLICATION TO AMEND APPROVAL No ____________

☐ APPLICATION FOR A LICENCE

CONSTRUCTION WAS APPROVED UNDER PERMIT No ____________

APPLICANT	CODE	APPLICANT'S AGENT FOR THIS APPLICATION	CODE
ADDRESS	CODE	ADDRESS	
CITY, TOWN OR VILLAGE	POSTAL CODE	CITY, TOWN OR VILLAGE	POSTAL CODE
SIGNATURE FOR APPLICATION	DATE DAY MO YEAR	CONTACT FOR APPLICATION	TELEPHONE
SUBSTANCE	CODE	H_2S (mol/kmol)	TECHNICAL STANDARD

SAMPLE ONLY

PIPE SPECIFICATION

A C D	I.D NO	O.D (mm)	WALL THICKNESS (mm)	MAT.	TYPE	GRADE	M.O.P (kPa)	STRESS LEVEL	JOINTS	I.P

PIPE LOCATION AND STATUS

A C D	LINE NO	FROM LOCATION						TO LOCATION						LENGTH (KM)	STAT.	ENVIR	I.D NO
		LS	SEC	TWP	RGE	M	F.C	LS	SEC	TWP	RGE	M	F.C				

INSTALLATIONS

A C D	INST NO	LOCATION					TYPE	POWER (KW)	P.M	STAT.
		LS	SEC	TWP	RGE	M				

BOARD USE ONLY

BOARD FEE	
RECEIPT NO	
AREA OFFICE	

	INITS	DATE DAY	MO	YEAR
TECHNICALLY SATISFACTORY				
CLEARED FOR SIGNATURE				

APPROVAL EXPIRY DATE		
DAY	MO	YEAR

APPROVAL SIGNATURE Energy Resources Conservation Board	DATE DAY	MO	YEAR

THIS APPROVAL IS GRANTED SUBJECT TO THE ATTACHED CONDITIONS NUMBERED ____________________________

PL-100-86-03

LS 12
(Rev. 1/87)

Alberta
FORESTRY, LANDS AND WILDLIFE

PLEASE PRINT OR TYPE

APPLICATION

APPLICATION NUMBER

☐ NEW ☐ RENEWAL

MINERAL SURFACE LEASE (MSL) ☐ | LICENCE OF OCCUPATION (LOC) ☐

PIPELINE INSTALLATION LEASE (PIL) ☐ | EASEMENT (EZE) ☐ | R.E.A. EASEMENT (REA) ☐ | OTHER (Specify)

PIPELINE NON-REGULATED ☐
Line Length ______________ km
Pipe Diameter ______________ mm

PIPELINE REGULATED ☐
______________ km
______________ mm

Pipe Line Development and Reclamation Approval Number
____

POWERLINE
Length ______________ km
Kilovolts ______________

Is the area applied for within 100 metres of a river, stream, watercourse, lake or other waterbody? ☐ Yes ☐ No

TOTAL AREA ☐ ac. ☐ ha.

APPLICANT'S CORPORATE NAME OR SURNAME AND GIVEN NAMES.

MAILING ADDRESS

CITY/TOWN, PROVINCE, POSTAL CODE | APPLICANT'S FILE NO. | PHONE

AGENT'S NAME

MAILING ADDRESS

CITY/TOWN, PROVINCE, POSTAL CODE

Attached Sketch ☐ | Polyester or Linen plan ☐ | Occupant's Consent Attached ☐ To Fo[illegible] ☐ [illegible] ☐ | PHONE

PURPOSE OF APPLICATION (Specify)
Wellsite ☐ Access ☐ Other ☐

Width of Right-of-Way, Site Dimensions

LAND BEING APPLIED FOR (Attach [illegible]hedule i[illegible] [illegible]ufficient space)

NAME OF SUBDIVISION | [illegible]DIVIS[illegible] PLAN NO. | BLOCK | LOT | PARCEL

QTR/LS	SEC	TWP	RGE	MER	QTR/LS	SEC	TWP	RGE	MER	QTR/LS	SEC	TWP	RGE	MER

Are you a Canadian citizen? ☐ Yes ☐ No

Have you attai[illegible] the age of 18 yrs.[illegible] ☐ [illegible] ☐ No

Are you an employee of the Government of Alberta or member of the Legislative Assembly? ☐ Yes – Dept ______________ ☐ No

SIGNATURE

TITLE

DATE | AM[illegible]ED $

Authorization is hereby granted to enter upon and immediately occupy the public land as described on this application and as shown on the attached sketch subject to the following conditions:

______________ Date
______________ For Minister of Forestry, Lands and Wildlife

OFFICIAL USE ON[illegible] | P[illegible]T N[illegible]UMBER | CAN Number if applicable | RENEWAL DATE (Y,M,D) | EXPIRY DATE (Y,M,D)

DOC/SRPU Conflictions? ☐ [illegible] ☐ No ☐ See attached schedule

DOCUMENTATION PLAN NUMBER

FILE RECORDS

APPROVAL FROM	Lands	AFS	Env	F & W	Trans	Rec. & Pk.			
Referral Date									
Received Date									

COMMENTS

COPIES FOR
MUNICIPAL AUTHORITY
FIELD SERVICES
FOREST
F & W
OTHER
OTHER

APPLICATION | LSAS USE ONLY | LETTER OF AUTHORITY

SAMPLE ONLY

Alberta

FORESTRY, LANDS AND WILDLIFE

LS 24
(Rev 10/86)

SURFACE MATERIALS APPLICATION

PUBLIC LANDS DIVISION

SAMPLE ONLY

APPLICANT: Please Type or Print clearly in black ink. See other side for additional information	Lease Number SML

APPLICATION FOR:	SM Lease ☐		SM Licence ☐			Renewal of SM Lease ☐	
SURFACE MATERIAL REQUIRED	Manufacturing Clay ☐	Marl ☐		Sand ☐		Silica Sand ☐	
	Non-Manufacturing Clay ☐	Peat ☐		Sand & Gravel ☐		Topsoil ☐	
TO BE COMPLETED IN CONNECTION WITH LICENCE APPLICATION	Proposed Date of Commencement ______ 19__		Proposed Date of Completion ______ 19:__			Removal of ______ cu. yds.	

APPLICANTS Name	Applicant's Authorized Representative: Name:
Address:	Address:
Postal Code	Postal Code

Are you an employee of the Alberta government or member of the Legislative Assembly of the Province of Alberta? Yes ☐ Dept. ______. No ☐

Are you a Canadian Citizen? Yes ☐ No ☐	Have you attained the age of 18 years? Yes ☐ No ☐	Attached: S[illegible] ☐ Linen [illegible] Polv[illegible] Pla[illegible] ☐ Occupant's Consent Attached ☐ Not Required ☐

LAND DESCRIPTION (Attach schedule if [illegible])

Twp.	Rge.	Mer.	¼ Section	T[illegible]	[illegible]	[illegible]r.	¼ Section

Date	Signature of Applicant or Representative	Phone No.:

FOR DE[illegible]MENTAL USE ONLY

Authorization is hereby granted to enter u[illegible]and [illegible]tely occupy the public land as described by this form and as shown on the attached sketch subject to the following conditions:

Date ______

For Minister of Forestry, Lands and Wildlife

APPLICATION

SRPU Conflictions Yes ☐ No ☐	Su[illegible] Townsh[illegible] Re[illegible] Required	Surface File Records	LOA Entered SRPU ☐	Surface Twp. Records ☐	Audit Cards Completed

Operating Plan Approved Date	O[illegible] Acreage	
	Di[illegible]on	
Date of Lease or Licence	years	Area Acres
Application Fee	[illegible]mount	Receipt Numbers
Security Deposit:		
Tbr. Damages:		
Rental		
Surcharge		Amount Due $ ______
Total Consideration:		Refund $ ______

Final Check

S.L.D.S. Checks	S.R.P.U.	Surface Twp Records
Surface File Records	Documentation	

COPIES OF LOA AND DESCRIPTION

Fish & Wildlife	Transportation	Parks
Field Services	A.F.S.	D.S.A.
Municipal Authority	Other	Environment

ACCOUNTS USE ONLY

Rental Account No.	Index:
Royalty Account No	Guide:
Diary:	Checked By
Prepared by:	

REMARKS:

______ Recommended

______ Approved

LS 24
(Rev. 10/86)

IMPORTANT: AN APPLICATION FOR A LICENCE OR LEASE MUST BE ACCOMPANIED BY A SKETCH SHOWING THE LANDS REQUIRED AND THE MEANS OF ACCESS. ALSO, WHERE THE APPLICATION IS FOR A LICENCE, AN OPERATING PLAN IS REQUIRED. NO OPERATIONS OF ANY KIND MAY TAKE PLACE ON THE LANDS APPLIED FOR UNTIL SUCH TIME AS AN OPERATING PLAN HAS BEEN APPROVED IN WRITING BY THE ASSISTANT DEPUTY MINISTER.

SCHEDULE

1.		For each lease application, except where the applicant is a municipality	$ 25.00
2.		For each licence application	10.00

Lease Rentals

3.	(a)	for leases issued for the removal of material excluding peat	7.00 p[illegible] or part there[illegible]
	(b)	for leases issued for the removal of peat	1[illegible]0 per acre, or part [illegible]hereof

Royalties

4.	Non-Manufacturing Clay	10[illegible]ic yard
5.	Manufacturing Clay	25[illegible]cubic yard
6.	Marl	[illegible]5¢/cubic yard
7.	Peat	05¢/cubic yard
8.	Top Soil	20¢/cubic yard
9.	Sand	15¢/cubic yard
10.	Sand and Gravel (Mixed)	25¢/cubic yard
11.	Gravel	25¢/cubic yard
	(where used as ballast by railway co[illegible]ies)	05¢/cubic yard
12.	Silica Sand	30¢/cubic yard
13.	Material removed from lan[illegible]under [illegible] licence held by a municipality or [illegible]ther [illegible]son and used in the construction and [illegible]ai[illegible]e of a public work or required by [illegible] Gove[illegible]t of Alberta	Nil

Security Deposits

14.	(a)	on all lease areas o[illegible]ences where active operations are intended for the removal of surface material.	Security deposit of $250.00 per acre on the approved operating area or acceptable negotiable security in a similar amount.
	(b)	for leases issued for the removal of peat	Nil

Surcharges

15. For licences issued on public pits

(a)	reclamation of public pits not operated by the Department	10¢/cubic yard
(b)	reclamation, management and administration of public pits operated by the Department	an amount established by the Minister.

SAMPLE ONLY

LS 1
(Rev. 6/86)

Alberta FORESTRY, LANDS AND WILDLIFE

PLEASE PRINT OR TYPE

APPLICATION

APPLICATION NUMBER

MISCELLANEOUS PERMIT (MLP) ☐ MISCELLANEOUS LEASE (MLL OR MTS) ☐

☐ NEW ☐ RENEWAL

RECREATIONAL LEASE (REC) ☐ OTHER (Specify)

TOTAL AREA ☐ac. ☐ha.

APPLICANT'S CORPORATE NAME OR SURNAME AND GIVEN NAMES

☐ Tenants in Common

MAILING ADDRESS

☐ Joint Tenants (see reverse)

CITY/TOWN, PROVINCE, POSTAL CODE | APPLICANT'S FILE NO. | PHONE

AGENT'S NAME

MAILING ADDRESS

CITY/TOWN, PROVINCE, POSTAL CODE | PHONE

LAND BEING APPLIED FOR (Attach schedule if insufficient space)

NAME OF SUBDIVISION	SUBDIVISION PLAN N	BLOCK	LOT	PARCEL

QTR/LS	SECTION	TWP	RGE	MER

IMPORTA[illegible] Appli[illegible]ons [illegible] outside subdivisions must be submitted

☐ *An accu[illegible] [illegible] showing location in quarter section, and [illegible] area applied for.*

☐ *Detailed [illegible] plan of proposed development*

☐ *[illegible] [illegible]ision of proposed development*

☐ *Written consent(s) if application conflicts with existing disposition(s)*

PROPOSED USE | ESTIMATED LENGTH OF TIME LAND IS REQ D

PROPOSED DEVELOPMENT

EXISTING DEVELOPMENT IF ANY

Is the area applied for within 100 metres of a river, stream, watercourse, lake or other waterbody? ☐Yes ☐No

Are you a Canadian citizen? ☐ Yes ☐ No

Have you [illegible] the age of [illegible] ☐ [illegible] ☐ No

Are you an employee of the Government of Alberta or member of the Legislative Assembly? ☐Yes Dept ____________ ☐No

SIGNATURE

TITLE

DATE

[illegible] ENCLOSED

Authorization is hereby granted to enter upon and immediately occupy the public land as described on this application and as shown on the attached sketch subject to the following conditions·

Date

For Minister of Forestry, Lands and Wildlife

OFFICIAL U[illegible] [illegible] | C[illegible]T I.D. NUMBER | CAN Number if applicable | RENEWAL DATE (Y,M,D) | EXPIRY DATE (Y,M,D)

DOC'SRPU Conflict[illegible] ☐ Yes ☐ No ☐ See attached schedule

DOCUMENTATION PLAN NUMBER

FILE RECORDS

APPROVAL FROM	Lands	AFS	Env	F & W	Trans	Rec & Pk			
Referral Date									
Received Date									

COMMENTS

COPIES FOR

MUNICIPAL AUTHORITY

FIELD SERVICES

FOREST

F & W

OTHER

OTHER

APPLICATION LSAS USE ONLY LETTER OF AUTHORITY

SAMPLE ONLY

LS 1
(Rev. 6/86)

The following is an explanation of Joint Tenants and Tenants in Common:

JOINT TENANTS

Joint tenancy is where, upon the death of one title holder, the deceased's interest passes to the other title holder rather than the deceased's estate. (Joint tenancy is the usual agreement in a husband and wife title).

TENANTS IN COMMON

Tenants in common is where, upon the death of one title holder, the deceased's int[illegible]es to the deceased's estate and NOT to the other title holder.

SAMPLE ONLY

LS 2
(Rev. 4/87)

Alberta
FORESTRY, LANDS AND WILDLIFE

PLEASE PRINT OR TYPE

AMENDMENT

DEPARTMENT APPLICATION/LEASE NO.

REASON FOR AMENDMENT

☐ CHANGE OF ROUTE ☐ CHANGE OF LOCATION

☐ WIDTH OF RIGHT-OF-WAY From To

☐ DIMENSIONS From To

☐ PURPOSE From To

☐ OTHER (specify)

Is the area applied for within 100 metres of a river, stream, watercourse, lake or other waterbody? ☐ Yes ☐ No

APPLICANT'S CORPORATE NAME OR SURNAME AND GIVEN NAMES

☐ Tenants in Common

MAILING ADDRESS

☐ Joint Tenants (see reverse)

CITY/TOWN, PROVINCE, POSTAL CODE

APPLICANT'S FILE NO.

[illegible] TO

AGENT'S NAME

Attached Sketch ☐ Polyester or Linen Plan ☐ Occupant's Consent Attached ☐ [illegible] Form[illegible] ☐ [illegible] ☐

Phone

LANDS AFFECTED (Attach s[illegible] space)

ADD LANDS					DELETE LANDS					LANDS NOW REQUIRED				
SUBDIVISION	Sub Plan No.	BLK.	LOT	PAR.	SUBDIVISION	Sub Plan No.	BLK.	LOT	PAR.	SUBDIVISION	Sub Plan No.	BLK.	LOT	PAR.
QTR/LS	SEC	TWP	RGE	MER	QTR/LS	SEC	TWP	RGE	MER	QTR/LS	SEC	TWP	RGE	MER

Are you a Canadian citizen? ☐ Yes ☐ No

Have yo[illegible] the ag[illegible] yrs.? ☐ Yes ☐ No

Are you an employee of the Government of Alberta or member of the Legislative Assembly? ☐ Yes-Dept. ____________ ☐ No

SIGNATURE

TITLE

DATE

AMO[illegible] ENCLOSED

Authorization is hereby granted to enter upon and immediately occupy the public land as described on this application and as shown on the attached sketch subject to the following conditions:

Date

For Minister of Forestry, Lands and Wildlife

OFFICIAL USE ONLY

DDC/SRPU Conflictions? ☐ Yes ☐ No ☐ See attached schedule

CLIENT I. D. NUMBER

DOCUMENTATION PLAN NUMBER

FILE RECORDS

APPROVAL FROM	Lands	AFS	Env.	F & W	Trans.	Rec.& Pk.			
Referral Date									
Received Date									

COMMENTS

COPIES FOR
MUNICIPAL AUTHORITY
FIELD SERVICES
FOREST
F & W
OTHER
OTHER

APPLICATION LSAS USE ONLY LETTER OF AUTHORITY

SAMPLE ONLY

APPLICATION PLAN REQUIREMENTS

1. **Minimum Information Required on Sketch or Plan**

- minimum scale of 1:50,000
- scale and north arrow stated on sketch.
- the proposed right-of-way or site outlined in red in accordance with the "Lands being applied for" portion of the application. The area outlined in red should always reflect all lands required and in the case of amendments should include both additional lands required and the lands required that were previously approved or applied for.
- section and quarter section boundaries shown on sketch.
- sections numbered on sketch.
- drawn to scale.
- for applications involving bed and shore of waterbodies, in addition to the above requirements, the location of the bank must be shown.
  NOTE - The terms shoreline, edge of lake and ordinary high water mark are synonymous with the term "bank". The bank is to be found by examining the bed and the upland and ascertaining where the presence and action of water are so common and usual, and so long continued in ordinary years, as to mark upon the soil of the bed a character distinct from that of the upland, in respect to vegetation, as well as in respect to the nature of the soil itself.

2. **Preferred Additional Information to be Shown on Sketch or Plan**

- the location of all rivers, streams, watercourses or other waterbodies.
- existing development including roads, powerlines, pipelines, wellsites and buildings.
- dimensions of right-of-way or site applied for.

3. **Examples of Acceptable Sketches or Plans**

- an original or clearly legible photocopy of a 1:50,000 National Topographic System Map or Forest Cover Map with lands applied for outlined in red and section and quarter section boundaries shown.
- a plan of survey.
- an original or clearly legible copy of an air photo mosaic with lands applied for outlined in red and section and quarter section boundaries shown.
- a clearly legible copy of a Surface Rights Plotting Unit township plot with lands applied for outlined in red.
- an original or clearly legible photocopy of a 1:15,000 Phase III Inventory Map with lands applied for outlined in red and section and quarter section boundaries shown.

4. **Please Note:**

- *These requirements [illegible] sufficient for the processing [illegible] review of most applications. In certain cases, the applicant may be requested to provide additional information in support of the application [illegible] more detailed sketch or site plan. Additional plans, surveys or metes and bounds descriptions may also be required after approval of an application so that a legal description of the lands may be prepared.*

For further information: Special Land Dispositions Section, Public Lands Division, Edmonton, 427-

DEFINITIONS

Joint Tenants

Joint tenancy is where, upon the death of one title holder, the deceased's interest passes to the other title holder rather than the deceased's estate. (Joint tenancy is the usual agreement in a husband and wife title).

Tenants In Common

Tenants in common is where, upon the death of one title holder, the deceased's interest passes to the deceased's estate and NOT to the other title holder.

SAMPLE ONLY

Alberta
ENVIRONMENT

APPLICATION
for LICENCE

Pursuant to Sec. 11 (1) (a) (b) (c)
WATER RESOURCES ACT

SAMPLE ONLY

APPLICANT'S NAME: ______________________________
Please type or print full name clearly

ADDRESS: ______________________________
Street, P.O. Box or R.R. No.

______ ______________________________
Phone No. City, Town or Village Province Postal Code

hereby applies for authority to construct the works shown on plans filed in connection with this application and for the right to divert ____________ acre-feet of water annually from ______________________________

____
Name of stream, lake, reservoir, aquifer or other source of supply

at a point in

					W
LSD	or Quarter	Section	Township	Range	Meridian

for ______________________________ purposes.

The lands on which the works are to be built are held as follows

as registered owner ☐; purchaser under agreement for sale ☐; lessee ☐; renter ☐;

to be negotiated ☐. (Check applicable boxes)

(If several parcels are affected by proposed works show ownership of each on an accompanying map)

Plans, supporting data and reports showing [illegible] water requirements, construction and operating procedures accompany this application or are to be filed on my behalf by:

______________________________ ______________
Name and address of consultant, [illegible] engineering services Phone No

I/We agree to construct works in accordance with plans filed and approved in connection with this application and to recognize the rights of other water users.

____
Signature(s) of applicant or signing authority

Date ______________ 19 ______ ______________________________
Type or print name and title of signing authority

OTHER APPLICATION FORMS Under the Water Resources Act available on request WR 1A – Drainage – Sec. 11 (1)(d) WR 1B – Permits – Sec. 11 (1)(e) WR 1C – Exploration Permit – Sec. 15	**FORWARD COMPLETED APPLICATIONS TO:** Controller of Water Resources Alberta Environment Oxbridge Place 9820 – 106 Street Edmonton, Alberta. T5K 2J6

FOR WATER RIGHTS OFFICE USE ONLY:

Advertising required ☐; waived ☐ ☐ File No. ____________

Priority No.

Year	Month	Day	Number

Recorded by: ____________

Approved: Date ______________ 19 ______ By ______________
Controller of Water Resources

WR 1 (DEC/83)

SEE OVER FOR INFORMATION FOR APPLICANTS

INFORMATION FOR APPLICANTS

An application to divert and use water, under provisions of The Water Resources Act, consists of the completed form together with data, plans, reports and specifications in sufficient detail to permit evaluation of the effect of the proposed works on:

(a) the source of supply

(b) other water users in the vicinity

(c) other lands and works

Unless appropriate authority has been received it is a violation of The Act to construct works or to divert water.

EXCERPT FROM THE WATER RESOURCES ACT

11(1) On application being made as provided in this Act and the regulation[illegible] may acquire, subject to any valid and subsisting rights,

(a) a licence to divert and use water for any or all of the follo[illegible]urposes:

(i) domestic purposes;

(ii) municipal purposes;

(iii) irrigation and other agricultural pur[illegible]

(iv) industrial purposes;

(v) water power purposes;

(vi) other like purposes;

(b) a licence to impound wate[illegible] purpo[illegible] of water management, flood control, erosion control, flow regulation, co[illegible] recreation or the propagation of fish or wildlife or for any like [illegible]pose;

(c) a licence to u[illegible] [illegible]ontur[illegible]te for the purpose of conservation, recreation or the propaga[illegible] or [illegible]r any like purpose;

(d) a licence to [illegible], otherwise than by impoundment or storage, for the purpose of water [illegible]ood control, drainage, erosion control or channel re-alignment or for any [illegible]

(e) [illegible]

(i) to [illegible] build or erect in, over, under, on or adjacent to any water any [illegible]ucture, [illegible]ce, contrivance or thing, or any earth, sand, gravel or other material, [illegible]nterfere with or will be capable of interfering with the present or future [illegible]opment, conservation or management of that water, or

[illegible] remove or disturb any earth, sand, gravel or other material forming part of the bed, shore or banks of any water, where the removal or disturbance will interfere with or will be capable of interfering with the present or future development, conservation or management of water.

18(1) An applicant for a licence or permit referred to in section 11(1) shall file with the Minister an application in writing in the form and containing the particulars that the Minister may from time to time prescribe and shall set out the nature of the proposed diversion or works and the purpose thereof.

18(1) Subject to subsection (2), the Minister shall, forthwith after the filing of the application and plans, forward a notice of the filing to the office of the secretary-treasurer of the municipality in which the site of the proposed works is located, with a request that the notice be posted in a conspicuous and public place in his office for a period of 15 days from the date thereof, and the Minister shall also send 2 copies of the notice to the applicant who shall immediately post them and keep them posted for a period of 15 days from the date thereof at 2 conspicuous points at the site of the proposed works.

(2) Instead of proceeding under subsection (1), the Minister may require an applicant to publish in a newspaper published in the neighbourhood and to be named by the Minister, a notice of the filing of the application and plans.

(3) The notice referred to in subsection (2) shall be published at least once a week for 2 successive weeks, and shall contain a statement of the nature of the rights applied for and of the general character and location of the proposed works.

(4) Any person who objects to the granting of the application may, within a period of 30 days from the date of the first publication of the notice in the newspaper or the date of the posting of the notices in accordance with subsection (1), file with the Minister a statement of his reasons for objecting.

SAMPLE ONLY

Alberta
ENVIRONMENT

APPLICATION
for DRAINAGE LICENCE

Pursuant to Sec. 11 (1) (d)
THE WATER RESOURCES ACT

SAMPLE ONLY

APPLICANT'S NAME: ______________________________
Please type or print full name clearly

ADDRESS: ______________________________
Street, P.O. Box or R.R. No

__________ ______________________________
Phone No. City, Town or Village Province Postal Code

hereby applies for authority to construct the works shown on plans filed in connection with this application and for the right to divert water for flood control, drainage, and similar water management purposes on:

____
Name of stream or water body affected

These works are to be constructed on land described as follows:

point of outlet						W
	LSD or Quarter		Section	[illegible]	Range	Meridian

Other lands affected (attach key plan showing location of w[illegible] necessary)

____

____

The lands on which the works are to be b[illegible] are [illegible]d as follows:

as registered owner ☐ ; purchaser under ag[illegible]r sale ☐ , lessee ☐ ;

renter ☐ ; to be negotiated ☐ ([illegible]eck [illegible]cable boxes)

(If several parcels are affected b[illegible] proposed works show ownership of each on an accompanying map)

Plans, supporting data and [illegible]ts [illegible]g details of construction, operating procedures, and all areas benefiting from or in any way affected b[illegible] project accompany this application, or are to be filed on my behalf by

______________________________ __________
Name and address of consultant, [illegible] or [illegible]engineering services Phone No

I/We agree to cont[illegible] in accordance with plans filed and approved in connection with this application and to recognize the rights [illegible] water users

____
Signature(s) of applicant or signing authority

Date ______________ 19 ____

____
Type or print name and title of signing authority

OTHER APPLICATION FORMS Under The Water Resources Act available on request WR 1 – Licence – Sec. 11(1)(a) (b) and (c) WR 1B – Permits – Sec. 11 (1)(e) WR 1C – Exploration Permit – Sec. 15	**FORWARD COMPLETED APPLICATIONS TO:**

FOR WATER RIGHTS OFFICE USE ONLY:

Advertizing required ☐ ; waived ☐

File No ______________

Priority No				
	Year	Month	Day	Number

Recorded by ______________

Approved Date ______________ 19 ____ By ______________
Controller of Water Resources

WR 1A (NOV/82)

SEE OVER FOR INFORMATION FOR APPLICANTS

SAMPLE ONLY

INFORMATION FOR APPLICANTS

An application to divert and use water, under provisions of The Water Resources Act, consists of the completed form together with data, plans, reports and specifications in sufficient detail to permit evaluation of the effect of the proposed works on:

(a) the source of supply

(b) other water users in the vicinity

(c) other lands and works

On drainage projects the adequacy of the outlet channel or receiving water body must be determined before authorization to construct can be issued.

Unless appropriate authority has been received it is a violation of The Act to construct works or to divert water.

EXCERPT FROM THE WATER RESOURCES ACT

11(1) On application being made as provided in this Act and the regulations, a person may acquire, subject to any valid and subsisting rights,

(a) a licence to divert and use water for any or all of the following [illegible]:

(i) domestic purposes;

(ii) municipal purposes;

(iii) irrigation and other agricultural p[illegible]

(iv) industrial purposes;

(v) water power purposes;

(vi) other like purposes;

(b) a licence to impound water for the purpose of water management, flood control, erosion control, flow regulation, conservation, recreation or the propagation of fish or wildlife or for any li[illegible]

(c) a licence to use water i[illegible] state for the purpose of conservation, recreation or the propa[illegible]on of fish or w[illegible]or for any like purpose;

(d) a [illegible] dive[illegible]t[illegible]erwise than by impoundment or storage, for the purpose of w[illegible] mana[illegible]ment[illegible] control, drainage, erosion control or channel re-alignment or fo[illegible]pose,

[illegible]mit

[illegible] place, build or erect in, over, under, on or adjacent to any water any [illegible] device, contrivance or thing, or any earth, sand, gravel or other material, [illegible] will interfere with or will be capable of interfering with the present or future [illegible]lopment, conservation or management of that water, or

(ii) to remove or disturb any earth, sand, gravel or other material forming part of the bed, shore or banks of any water, where the removal or disturbance will interfere with or will be capable of interfering with the present or future development, conservation or management of water

15(1) An applicant for a licence or permit referred to in section 11(1) shall file with the Minister an application in writing in the form and containing the particulars that the Minister may from time to time prescribe and shall set out the nature of the proposed diversion or works and the purpose thereof.

16(1) Subject to subsection (2), the Minister shall, forthwith after the filing of the application and plans, forward a notice of the filing to the office of the secretary-treasurer of the municipality in which the site of the proposed works is located, with a request that the notice be posted in a conspicuous and public place in his office for a period of 15 days from the date thereof, and the Minister shall also send 2 copies of the notice to the applicant who shall immediately post them and keep them posted for a period of 15 days from the date thereof at 2 conspicuous points at the site of the proposed works.

(2) Instead of proceeding under subsection (1), the Minister may require an applicant to publish in a newspaper published in the neighbourhood and to be named by the Minister, a notice of the filing of the application and plans.

(3) The notice referred to in subsection (2) shall be published at least once a week for 2 successive weeks, and shall contain a statement of the nature of the rights applied for and of the general character and location of the proposed works.

(4) Any person who objects to the granting of the application may, within a period of 30 days from the date of the first publication of the notice in the newspaper or the date of the posting of the notices in accordance with subsection (1), file with the Minister a statement of his reasons for objecting.

Alberta

ENVIRONMENT

APPLICATION
for PERMIT

Pursuant to Section 11 (1) (e)
THE WATER RESOURCES ACT

SAMPLE ONLY

APPLICANT'S NAME: ______________________________
Please type or print full name clearly

ADDRESS: ______________________________
Street, P.O. Box or R.R. No.

______________ ______________ ______________ ______________
Phone No. City, Town or Village Province Postal Code

hereby applies for authority to ______________________________

____
(Construct a pipeline, bridge, telecommunication cable, bank protection works, remove gravel, brush, improve channel, or other similar work)

at a point in

					W
LSD or Quarter		Section	Township	[illegible]	Meridian

Name of Stream or Waterbody affected ______________________________

Tentative Starting Date (if application is approved) ______________________________

Plans, supporting data and reports showing details of co[illegible] [illegible] operating procedures accompany this application, or are to be filed on my behalf by:

______________________________ ______________
Name and address of consultant, agent or other engineering service Phone No

Permit to be forwarded to ______________________________

List Names of Streams and Legal Land Description[illegible] Add[illegible]al Stream Crossings (Attach list if necessary)

____

____

____

I/We agree to construct [illegible] co[illegible]nce with plans filed and approved in connection with this application and to recognize the ri[illegible] of othe[illegible]ers.

Date ______________ 19 ______

____
Signature(s) of applicant or signing authority

____
Type or print name and title of signing authority

[illegible]R APPLICATION FORMS Under The Water Resources Act available on request WR 1 – Licence – Sec. 11(1)(a) (b) and (c) WR 1A – Drainage – Sec. 11 (1)(d) WR 1C – Exploration Permit – Sec. 15	**FORWARD COMPLETED APPLICATIONS TO:**

FOR WATER RIGHTS OFFICE USE ONLY:

Advertizing required ☐; waived ☐

File No. ______________

Priority No.

Year	Month	Day	Number

Recorded by: ______________

Approved: Date ______________ 19 ______ By ______________
Controller of Water Resources

WR 1B (Sept/80)

SEE OVER FOR INFORMATION FOR APPLICANTS

INFORMATION FOR APPLICANTS

An application for a permit, under provisions of The Water Resources Act, consists of the completed form together with data, plans, reports and specifications in sufficient detail to permit evaluation of the effect of the proposed works or work on the stream(s) or waterbodies listed on the application form.

Unless appropriate authority has been received it is a violation to conduct any of the activities mentioned under Section 11 (1) (e) (i) and (ii) of The Water Resources Act.

EXCERPT FROM THE WATER RESOURCES ACT

11(1) On application being made as provided in this Act and the regulations, a person may acquire, subject to any valid and subsisting rights,

(a) a licence to divert and use water for any or all of the following purposes:

(i) domestic purposes;

(ii) municipal purposes;

(iii) irrigation and other agricultural purposes;

(iv) industrial purposes;

(v) water power purposes;

(vi) other like purposes;

(b) a licence to impound water for the [illegible] of [illegible] [illegible], flood control, erosion control, flow regulation, [illegible] [illegible] or the propagation of fish or wildlife or for any like purpose;

(c) a licence to use water [illegible] [illegible] state for [illegible] [illegible] of conservation, recreation or the propagation of [illegible] [illegible] for any like purpose;

(d) a licence to divert water, [illegible] [illegible] [illegible] impoundment or storage, for the purpose of water [illegible], flood [illegible] [illegible], erosion control or channel re-alignment or for any [illegible] [illegible]

(e) a [illegible]

[illegible] [illegible], build or erect in, over, under, on or adjacent to any water any [illegible] [illegible], contrivance or thing, or any earth, sand, gravel or other material, [illegible] [illegible] [illegible] with or will be capable of interfering with the present or future [illegible], conservation or management of that water, or

[illegible] remove or disturb any earth, sand, gravel or other material forming part of [illegible] [illegible], shore or banks of any water, where the removal or disturbance will interfere [illegible] or will be capable of interfering with the present or future development, conservation or management of water.

[illegible]) An applicant for a licence or permit referred to in section 11(1) shall file with the Minister an application in writing in the form and containing the particulars that the Minister may from time to time prescribe and shall set out the nature of the proposed diversion or works and the purpose thereof.

16(1) Subject to subsection (2), the Minister shall, forthwith after the filing of the application and plans, forward a notice of the filing to the office of the secretary-treasurer of the municipality in which the site of the proposed works is located, with a request that the notice be posted in a conspicuous and public place in his office for a period of 15 days from the date thereof, and the Minister shall also send 2 copies of the notice to the applicant who shall immediately post them and keep them posted for a period of 15 days from the date thereof at 2 conspicuous points at the site of the proposed works.

(2) Instead of proceeding under subsection (1), the Minister may require an applicant to publish in a newspaper published in the neighbourhood and to be named by the Minister, a notice of the filing of the application and plans.

(3) The notice referred to in subsection (2) shall be published at least once a week for 2 successive weeks, and shall contain a statement of the nature of the rights applied for and of the general character and location of the proposed works.

(4) Any person who objects to the granting of the application may, within a period of 30 days from the date of the first publication of the notice in the newspaper or the date of the posting of the notices in accordance with subsection (1), file with the Minister a statement of his reasons for objecting.

SAMPLE ONLY

Alberta

ENVIRONMENT

APPLICATION
for EXPLORATION PERMIT

Pursuant to Sec. 15
THE WATER RESOURCES ACT

APPLICANT'S NAME: ______________________________
Please type or print full name clearly

ADDRESS: ______________________________
Street, P.O. Box or R.R. No.

______ ______________________________
Phone No · City, Town or Village · Province · Postal Code

hereby applies for authority to make all necessary examinations and surveys in order to evaluate the feasibility of obtaining a groundwater supply at the following location:

LSD	or Quarter	Section	Township	Range	[illegible]ridian

SAMPLE ONLY

for ______________________________ purposes
(e.g. domestic, subdivision, municipal, irrigation [illegible] ge etc.)

Anticipated depth interval to be investigated ______ [illegible]t to ______ feet.

Estimated daily requirement ______________ Canadian gallons per day

If anticipated use is seasonal, indicate those [illegible]ths during which water will be pumped. ______________

____

____

Name of Consultant or A[illegible] cond[illegible]ting [illegible]ation on my behalf ______________

______________________________ ______________
Phone No

Permit to be forw[illegible] ______________________________

[illegible]te ______________ 19 ____

____
Signature(s) of applicant or signing authority

____
Type or print name and title of signing authority

OTHER APPLICATION FORMS Under The Water Resources Act available on request WR 1 – Licence – Sec. 11(1)(a) (b) and (c) WR 1A – Drainage – Sec. 11(1)(d) WR 1B – Permits – Sec. 11(1)(e)	**FORWARD COMPLETED APPLICATIONS TO:** Controller of Water Resources Alberta Environment Oxbridge Place 9820 – 106 Street Edmonton, Alberta T5K 2J6

FOR WATER RIGHTS OFFICE USE ONLY:

Advertize Immediately ☐ Defer Advertizing ☐

File No. ______________

Unique No.

Year	Month	Day	Number

Recorded by ______________

Comments ______________________________

____

SEE OVER FOR INFORMATION FOR APPLICANTS

WR 1C (Sept/82)

EXCERPT FROM THE WATER RESOURCES ACT

18(1) An applicant for a licence or permit referred to in section 11(1) shall file with the Minister an application in writing in the form and containing the particulars that the Minister may from time to time prescribe and shall set out the nature of the proposed diversion or works and the purpose thereof.

(2) The Minister may in his discretion grant to the applicant an exploration permit on any conditions he thinks fit authorizing the applicant to make all necessary examinations and surveys to prepare plans and sections, showing the extent of the proposed operations and the land that will be affected by reason of any proposed diversion.

(3) The term of an exploration permit shall be one year from its date but the [illegible] may from time to time extend the term for a period not exceeding one further year.

(4) The person to whom an exploration permit is granted is entitled [illegible] any assistants that are necessary to enter into and on any public or private land to [illegible] make [illegible] and do other necessary work for the purpose of completing [illegible] examination [illegible] authorized by the permit.

(5) No unnecessary damage shall be done on [illegible] land in entering thereon or in taking levels, in making surveys or in do[illegible] other [illegible] work for the purpose of completing the examination and survey authoriz[illegible] by the p[illegible]

(6) The applicant, after completing [illegible] preliminary [illegible] and survey, may file with the Minister an application for a licence [illegible] form and con[illegible] the particulars that the Minister may require, setting out the n[illegible] and e[illegible] of the proposed diversion or works.

(7) Notwithstanding anything in th[illegible] no p[illegible] is entitled to apply for a licence under section 11(1) to divert [illegible] use ground [illegible] he has

(a) obtained [illegible] perm[illegible] under this section pertaining to an examination and survey o[illegible] water, and

(b) [illegible] com[illegible] the exploration permit, this section and the regulations,

a[illegible] to [illegible] apply to the application and the exploration permit.

19(1) [illegible] (2), the Minister shall, forthwith after the filing of the application and pl[illegible] notice of the filing to the office of the secretary-treasurer of the munic[illegible] in w[illegible] site of the proposed works is located, with a request that the notice be [illegible] conspicuous and public place in his office for a period of 15 days from the date [illegible] the Minister shall also send 2 copies of the notice to the applicant who shall [illegible]diately post them and keep them posted for a period of 15 days from the date thereof at 2 [illegible]spicuous points at the site of the proposed works.

[illegible]) Instead of proceeding under subsection (1), the Minister may require an applicant to publish in a newspaper published in the neighbourhood and to be named by the Minister, a notice of the filing of the application and plans.

(3) The notice referred to in subsection (2) shall be published at least once a week for 2 successive weeks, and shall contain a statement of the nature of the rights applied for and of the general character and location of the proposed works.

(4) Any person who objects to the granting of the application may, within a period of 30 days from the date of the first publication of the notice in the newspaper or the date of the posting of the notices in accordance with subsection (1), file with the Minister a statement of his reasons for objecting.

SAMPLE ONLY

APPENDIX E

GLOSSARY

APPENDIX E

GLOSSARY

Access Road (Permanent) - any road with established grade and drainage ditches for erosion control. It must be structurally sound for all seasons. A minimum easement of 22m is required.

Access Road (Temporary) - any road which lacks established grade or drainage ditches for erosion control. Temporary roads are restricted as follows:

- maximum 12m in width
- must be the most direct route possible
- must have minimum requirements for grading and tree clearing

Adit - an approach, or in the case of mines a horizontal entrance.

Aesthetic Value - the characteristics of an area which is pleasing to the human eye, particularly when the area is in its natural state.

Alkaline Soil - any soil that has a pH greater than 7.0.

Alpine Tundra - an ecological term which denotes the land area above the treeline and below barren rock.

Angle of Repose - the maximum angle that the inclined surface of a pile of loosely divided material can make with the horizontal (approximately 37 degrees).

Ambient Temperature - the normal or average temperature of an area based on historical records.

Annulus Vent - section of pipe inside the well casing.

Aquifer - a water bearing stratum of permeable rock, sand or gravel.

Battery - arrangement of tanks receiving effluents of one or more wells; may include equipment for separating effluents into oil, gas and/or water for measurement.

Berm - a man-made embankment of soil used to divert water resulting from rainfall.

Best Applied Technology - pollution control or process technology which is technically practicable by virtue of current usage or extrapolation in similar types and sizes of applications, is environmentally sound (by affording an adequate degree of protection) but is economically beyond what under normal circumstances would be considered practical.

Best Practical Technology - pollution control or process technology which is technically practicable by virtue of current usage or extrapolation in similar types and sizes of application, is environmentally sound (by affording an adequate degree of protection) and economically or financially practical in that the normally healthy sector of the industry in question or a municipality can install the technology over a reasonable time period without undue economic disruption.

Biocide - a chemical substance that is destructive to many different organisms.

Binder - a substance that produces or promotes cohesion in loosely assembled substances.

Bitumen - any of various mixtures of hydrocarbons often together with nonmetallic derivatives that occur naturally or are obtained as residues after heat refining naturally occurring substances

Bladder - plastic or rubber container to store fuel.

Bole - the trunk of a tree.

Buffer Strip - a strip of undisturbed land adjacent to a disturbed area that retards the flow of runoff water, causing deposition of transported material thereby reducing sedimentation of receiving streams.

Cache - a storage or hiding site where supplies are left for future use.

Capillarity - the action by which water in the small pores of the soil is elevated and held by surface tension.

Check Dam - a barrier constructed across a drainageway to retard water flow and to form a small sediment catch basin. Check dams are usually constructed from timbers, piled-up rocks or gabions.

Clean Out Fluids - acid solution, light oil or chemical solutions used to increase well production.

Colonial Nesters - birds which nest in their normal habitat (as opposed to migratory birds).

Compaction - the closing of pore spaces among particles of soil and rock by natural means or with the use of heavy equipment.

Coniferous - cone-bearing trees such as most evergreen trees and shrubs.

Contaminant - any foreign compound which is not naturally present and which is introduced into the environment by man.

Contingency Plan - a plan which is used to minimize the effects of possible but unpredictable events such as an oil spill.

Core Drilling - the process by which a cylindrical sample of rock and other strata is obtained through the use of a hollow drilling bit that cuts and retains a section of the strata penetrated.

Corrosive - having the ability to corrode or oxidate a material by chemical action.

Corridor - cleared access routes in forested regions.

Counterforts - are built as headers to retain the face of a wall from sliding. Often, gabion structures are used to retain clay slopes.

Cross Ditch - a ditch constructed horizontal to the disturbed slope for the purpose of retarding the flow of water, thereby reducing the sediment load.

Debris - surface stripping, slash, stumps, unmerchantable timber and brush.

Deleterious - any compound which, when introduced into the environment, produces a harmful effect, such as the poisoning of fish in a river.

Development and Reclamation Approvals - required for regulated pipelines and sand and gravel operations - see definition of "Regulated".

Dewpoint Temperature - the temperature at which a vapour condenses.

Diversion Ditch - a channel constructed across a slope to intercept surface runoff, changing the course of all or part of a stream or runoff, thereby reducing sediment problems.

Disposition - refers to a legal contract authorizing the use of public lands under various agreements such as sale, lease, permit, licence, etc.

Ecological Reserve - a land area used for the preservation of forests and natural habitats.

Endangered Species - any species of plant or animal which is on the verge of becoming extinct.

Erosion - the process of removal, transport, and redisposition of soil material from the surface of land by running water, wind, gravity or ice.

Exploration Approval - the approval of the preliminary plan for exploration.

Exploration Licence - the license required to conduct exploration.

Exploration Permit - the permit to operate exploration equipment.

Fauna - the animals of a distinct region.

Flora - the plants of a distinct region.

Flow Line - a pipe for:
- transmission of fluids from an oil well or wells to a tank, battery or common pipeline manifold
- transmission of water obtained from oil or gas for disposal to other than an underground formation.

Free Water - includes any standing or moving surface water but does not include short-term puddles or ponds formed due to precipitation.

Fill Area - that portion of a landfill site which has been or will be filled with refuse.

Flood Plain - any land liable to be inundated by a flood having the probability of being equalled or exceeded once in a defined period.

Frac - sand or acid injected into a formation

Gabions - compartmented rectangular containers of various sizes made of thickly galvanized steel wire mesh and filled with rock.

Geotechnical - relating to the form, arrangement, and structure of rock in the earth's crust.

Geotextiles - fibre material (plastic) used as a mat to separate fine wet soils from a road or stream bank base. The mat ensures the fines do not contaminate the base material but permit free flow of ground water.

Groundwater - subsurface water that occurs beneath the water table in soils and geologic formations

Growing Season - that portion of the year when the predicted daily minimum temperature (in an average year) falls above freezing or as otherwise agreed by the Department of Agriculture.

Grub - to clear rights of way by digging up all roots and stumps.

Gully Erosion - removal of soil by running water, causing formation of deep channels.

Habitat - the setting in which an animal or fish normally lives.

Hand Cutting - clearing of timber and brush utilizing hand tools, thereby leaving the root systems intact to minimize surface disturbance.

Hazardous Waste - refuse which, because of its inherent nature and quantity, requires special disposal techniques to avoid creating health hazards, nuisances or environmental pollution. Hazardous wastes are toxins or poisons, corrosives, irritants, strong sensitizers, flammables, explosives, infectious wastes, condemned foods, etc. Flammable wastes exclude plastics, paper, paper products and the like.

Herbaceous - all broad leaf vegetation excluding shrubs and trees and any woody vegetation.

Herbicide - a chemical agent used to destroy or inhibit plant growth.

High Sensitivity Areas - areas of high drainage density, steep slopes, unstable soils, unstable geologic substrata and areas where adverse climatic conditions restrict plant growth. For example, the Alpine Tundra, Subalpine and Canadian Shield Ecological Regions.

High Value Areas - areas which are rated as high value for timber, recreation, watershed, wildlife, range and archaeological or historic sites.

High Water Mark - the point of highest elevation of water at the water-land interface.

Hydrology - the science related to describing the distribution and circulation of water in the soil and on the land.

Hydro Seeding - a hydraulic method used to seed an area. Mulch and fertilizer are also commonly incorporated into the spraying mixture.

Incinerator - a combustion device specifically designed for volume reduction by controlled high temperature burning of solid, semi-solid, liquid or gaseous combustible wastes and from which the solid residues contain little or no combustible material.

Impervious or Impermeable Material - any material or compacted soil (such as clay) which prevents or minimizes the passage of water.

Inert Refuse - refuse containing no putrescible wastes and which will not leach to any significant extent. It excludes inert waste materials such as overburden from mining operations.

Indigenous - any plant or animal which occurs or lives naturally in a given area.

Infiltrate - to pass through or into a substance.

Infiltration Rate - the maximum rate at which water enters the soil under specific conditions, including an excess of water.

Infrastructure - the basic framework of a system such as highway and pipelines.

Key Wildlife Habitat Areas - habitat areas which are critical to a significant number of individuals of a species during at least part of the year, e.g., waterfowl staging and production areas, game bird dancing grounds, ungulate winter ranges. These areas are defined by Fish and Wildllife Division, AFLW.

Leachate - liquid flowing from a landfill which has extracted, dissolved or suspended material from the landfill.

Lop and Scatter - to remove and spread limbs, branches or tree tops, thereby reducing the fire hazard.

Low Sensitivity Areas - relatively flat areas with low drainage density, stable soils, and geologic substrata, which have only slight limitations for plant growth. For example, Mixed-Wood, Peace River Lowlands and Athabasca South ecological regions.

Low Value Areas - areas which are rated as low value for timber, recreation, wildlife range and archaeological or historic sites.

Marl - a calcareous clay.

Merchantable Timber - forests which have 25 or more green coniferous trees, exceeding 15m in height, on any hectare of land to be cleared.

Mercaptan - a sulphur-containing organic compound which has a disagreeable odor.

Meteorology - the science dealing with the atmosphere, especially in weather and weather forecasting.

Microsite - a small site where a seed can germinate.

Mineral Deposit - a natural accumulation of a mineral such as coal, copper, lead, uranium, etc.

Mulching - the addition of material (usually organic) to disturbed land surfaces to prevent erosion and retain soil moisture.

Natural Areas - parcels of land designated to preserve the diversity of environmental conditions in Alberta.

Open Burning - uncontrolled combustion of refuse where gaseous combustion products and other contaminants are discharged directly to the open air.

Overburden - overlying material.

Partial Disposal - mechanical or manual cutting of accumulated slash and debris done to reduce the fire hazard to acceptable levels and to improve aesthetics.

Percolation - the downward or lateral movement of water through the soil.

Percolation Test - a test used to determine the rate of passage of water through a permeable substance.

Pesticide - a chemical agent used to destroy or inhibit unwanted insects or other pests.

pH - the degree of acidity or alkalinity of a substance as measured by the concentration of hydrogen ions.

Pig - device used to clean the inside of well casings of pipe.

Proponent - a company or person proposing to undertake a petroleum development.

Pyrolysis - a method of organic solid waste disposal which brings about a chemical change in the waste through the application of low heat in a moist atmosphere.

Raptor - a bird of prey.

Receiving Water - any body of surface water into which a discharge of leachate or effluent may flow. Receiving waters wholly contained within a permitee's property are not included in this definition, provided that pollutants in such waters cannot be transported outside the property.

Reclamation - returning the land to its previous condition and productivity level. The objective is the maintainance of a balanced, aesthetic ecological state that does not contribute substantially to environmental deterioration.

Reconnaissance - a preliminary survey to gain information about a specific area.

Reconditioning (of wells) - stimulation or cleaning of a well.

Recontouring - grading disturbed land to an acceptable landform.

Recompletion (of wells) - procedure involving the recementing, redrilling and perforating of the pipe within the zone of production.

Recreation Area - potential and designated land areas which have been reserved or are used for recreational purposes.

Reforestation - the natural or artificial restocking of an area with forest trees.

Regolith - the unconsolidated mantle of weathered rock and soil materials above solid rock.

"Regulated" Pipelines - greater than 150mm in diameter and 16km in length.

"Regulated" Sand and Gravel Pits - greater than 5 acres in size, or on patented land.

Resource Impact Assessment - planning (thought) process done to assess the potential impacts (changes) which result when an exploration or development project is superimposed upon the natural resources.

Restoration - returning the land to a condition and productivity as close as possible to that which existed before the surface disturbance.

Revegetation - the process of seeding, tree planting, fertilization, etc. to establish vegetation in an area where the vegetation was previously removed.

Rip-rap - stones and rock which are used to prevent erosion from occurring in a given area.

Roach - convex layer of fill material above grade to compensate for settlement and minimize changes in natural drainage patterns.

Salinity - measurement of salt content.

Sediment - solid material, both mineral and organic, that is in suspension, being transported, or has been moved from the site or origin, by air, water, gravity or ice.

Sedimentation - the deposition of sediment.

Sensitive Soils - soils which are highly susceptible to erosion, once the vegetative cover has been removed, as a result of factors such as texture, structure and water holding capacity.

Skew - deviation from a straight line.

Siltation Control - the process of regulating the build-up of silt in a streambed.

Slash - the branches, bark, tops, cull logs, and broken or uprooted trees on the ground after logging.

Soil Material - a dynamic natural body on the surface of the earth, in which plants can grow, composed of mineral and organic materials, and living forms.

Solonetzic Soils - soils with a thin, viable surface layer underlain by a dark, hard, column or layer usually high in sodium, formed under arid or semi-arid climates.

Spoil - surplus, unuseable material as the result of clearing.

Staging Area - location where equipment is placed and stored in preparation for an activity.

Steep Slope - slope in excess of 27 degrees from the horizontal.

Subalpine Ecological Region - the land generally located on the mountain uplands between the alpine tundra and foothills ecological regions and characterized by subalpine vegetation.

Supernatant - floating on the surface of a liquid.

Tree Freeing - removal of trees along power line right-of-way that could fall on the power line.

Terrace - sloping ground cut into a succession of benches for purposes of controlling surface runoff, thereby minimizing soil erosion and assisting revegetation.

Topographic Map - a map showing the configuration of land surface and its relative elevation.

Total Disposal - complete removal and disposal of trees and brush by burning and/or limited burying to reduce fire hazard and improve aesthetics.

Topsoil - surface soil, including the organic layer in which plants have most of their root system.

Ungulate - a hooved mammal, usually possessing antlers, e.g., a moose.

Watercourse - canal, ditch, reservoir or other man-made surface structure to contain or convey water, whether it does so continuously or intermittently.
- bed and shore of a river, stream, lake, creek, or other natural body of water.

Water Diversions - redirecting the flow of a water route.

Waterflooding - injection of water to create a hydraulic pressure in a formation in order to extract oil.

Water Table - the upper surface of groundwater at which the soil is saturated with water.

Winter Access Road - any roadway which lacks established grade or drainage ditches for erosion control. It should be restricted to a maximum of 12m in width.

Working Face - that area of landfill operation at which placing, confining, or refuse is actively taking place.

APPENDIX F

REFERENCES

Appendix F

REFERENCES

TABLE OF CONTENTS

List of References F-2

ERCB Documents

Interim Directives (I.D) F-9
Informational Letters (I.L.) F-10
General Bulletins (G.B.) F-14

LIST OF REFERENCES

1. Acid Deposition Research Program. **Researching Acid Depositions: Workshop Proposals.**
   Available from: Acid Deposition Research Program, Calgary.
2. Acid Deposition Research Program. **NO x Control Technology for Compressor Engines in Alberta.**
   Available from: Acid Deposition Research Program, Calgary.
3. Adam, K.M. 1978. **Building and Operating Winter Roads in Canada and Alaska. North of 60 'series' Environmental Standards, No. 4.**
   Available from: Department of Indian and Northern Affairs, Ottawa.
4. Alberta Agriculture, 1975. **Negotiating Surface Rights, Agdex 878-1.**
   Available from: Alberta Agriculture, Farmers Advocate, Edmonton.
5. Alberta Agriculture. **Seismic Operations and Farmers Rights.**
   Available from: Alberta Agriculture, Farmers Advocate, Edmonton.
6. Alberta Agriculture. **Well Site Selection and the Surface Owner.**
   Available from: Alberta Agriculture Farmers Advocate, Edmonton.
7. Alberta Agriculture. **Surface Rights in Alberta.**
   Available from: Alberta Agriculture, Farmers Advocate, Edmonton.
8. Alberta Agriculture. **Pipeline and Surface Rights.**
   Available from: Alberta Agriculture, Farmers Advocate, Edmonton.
9. Alberta Energy. **The Route Selection Process: A Biophysical Perspective.**
   Available from: Alberta Energy, Edmonton.
10. Alberta Environment. **Guidelines for Industrial Landfills.**
    Available from: Alberta Environment, Edmonton.
11. Alberta Environment. **Elements of Engineering Design for a Sanitary Landfill, Waste Management Series, Publication No. 4.**
    Available from: Alberta Environment, Edmonton.
12. Alberta Fish and Wildlife Division, 1979. Eastern Slopes Wildlife Management. **Presented at Mobil Oil Ltd. Environmental Planning and Management Seminar. March 28 - 29, 1979, Red Deer.**
    Available from: Alberta Forestry,
13. Alberta Fish and Wildlife Division, 1982. **Fisheries Habitat Protection Guidelines.**
    Available from: Alberta Forestry, Lands and Wildlife. Fish and Wildlife Division, Edmonton.
14. Alberta Forest Service, 1984. **The Resource Handbook, Operational Guidelines for Industry. ENR Report No. 75.**
    Available from: Alberta Forestry Lands and Wildlife, Information Centre, Edmonton.
15. Alberta Forestry, Lands and Wildlife. **Reclamation with Native Grasses in Alberta: Field Trail Results.**
    Available from: Alberta Forestry, Lands adn Wildlife, Edmonton.
16. Alberta Forestry, Lands and Wildlife. **The Manual of Plant Species Suitability for Reclamation in Alberta, Volume I adn II.**
    Available from: Alberta Forestry, Land and Wildlife, Edmonton.

17. Alberta Forestry, Lands and Wildlife. **Forest Statistics Review.**
Available from: Alberta Forestry Lands and Wildlife, Information Centre, Edmonton.

18. Alberta Forestry, Lands and Wildlife. **Northeast Region Geophysical Operating Guidelines.**
Available from: Alberta Forestry, Lands and Wildlife, Information Centre, Edmonton.

19. Alberta Forestry, Lands and Wildlife. **Eastern Slopes Region Geophysical Operating Guidelines.**
Available from: Alberta Forestry, Lands and Wildlife, Information Centre, Edmonton.

20. Alberta Forestry, Lands and Wildlife. **Erosion Potentional Index - A Method of Evaluating Sheet Erosion at Stream Crossings.**
Available from: Alberta Forestry, Lands and Wildlife, Information Centre, Edmonton.

21. Alberta Forestry, Lands and Wildlife. **Resource Road Planning Guidelines.**
Available from: Alberta Forestry, Lands and Wildlife. Information Centre, Edmonton.

22. Alberta Forestry, Lands and Wildlife. **Stream Crossing Guidelines, Operational Guidelines for Industry.**
Available from: Alberta Forestry, Lands and Wildlife, Information Centre, Edmonton.

23. Alberta Public Safety Services. **Alberta Public Safety Services, compliance Guidelines, 1986.**
Available from: Alberta Public Safety Services, Dangerous Goods Control, Edmonton.

24. Alberta Research Council. **Hydrogeology, Misc. Groundwater Geology and Related Maps.**
Available from: Alberta Research Council, Publication Sales, Edmonton.

25. Alberta Water Well Association. **Water Well Construction Standards.**
Available from: Alberta Water Well Association, Edmonton.

26. American Petroleum Institute #1, 1975. **American Petroleum Institute Recommended Gas Plant Operating Practices for the Protection of the Environment. API Report 50.**
Available from: American Institute, Dallas, Texas.

27. American Petroleum Institute #2, 1975. **American Petroleum Institute Recommended Land Drilling Operating Practices for Protection of the Environment. API Report 52.**
Available from: American Petroleum Institute, Dallas, Texas.

28. American Petroleum Institute #1, 1974. **American Petroleum Institute Recommended Onshore Production Operating Procedures for Protection of the Environment. API Report 51.**
Available from: American Petroleum Institute, Dallas, Texas.

29. American Petroleum Institute #2, 1974. **Suggested Procedure for Development of Spill Prevention Control and Countermeasure Plans. API Report.**
Available from: American Petroleum Institute, Dallas, Texas.

30. Canadian Petroleum Association, 1976. **Alberta Oil Spill Cooperative Contingency Plan.**
Available from: Canadian Petroleum Association, Calgary.

31. Canadian Petroleum Association. **Gas Processing Plants, Waste Water Management Standards.**
Available from: Canadian Petroleum Association, Calgary.

32. Canadian Petroleum Association. **Gas Plant Sludge Characterization: Pilot Program.**
Available from: Canadian Petroleum Association, Calgary.

33. Canadian Petroleum Association, 1984. **Waste Management Guidelines for Oil Industry Operations.**
Available from: Canadian Petroleum Association, Calgary.

34. Canadian Petroleum Assoication. **Waste Disposal Guidelines for the Petroleum Industry.**
Available from: Canadian Petroleum Association, Calgary.

35. Canadian Petroleum Association. **Regulation of Hazardous Waste Generated by the Petroleum in the Prairie Provinces.**
Available from: Canadian Petroleum Association.

36. Canadian Petroleum Association. **Forest Growth and Revegetation Along Seismic Lines.**
Available from: Canadian Petroleum Association, Calgary.

37. Canadian Petroleum Association. **Guidelines for the Reclamation of Linear Disturbances.**
Available from: Candian Petroleum Association, Calgary.

38. Candian Petroleum Association. **Air Curtain Incinerators.**
Available from: Canadian Petroleum Assoication, Calgary.

39. Canadian Petroleum Association. **A Review of Corrosion with Reference to Rural Alberta.**
Available from: Canadian Petroleum Association, Calgary.

40. Canadian Petroleum Assoication. **Guidelines for Preparation of Sour Gas Emergency Procedures Plans for Sour Gas Facilities.**

41. Canadian Petroleum Association. **Habitat Enhancement and the Petroleum Industry.**
Available from: Canadian Petroleum Association, Calgary.

42. Canadian Petroleum Association. **Land Treatment for the Disposal of Oil Waste Sludges.**

43. Canadian Petroleum Association. **Guidelines for Preparation of Emergency Procedure Plans for Drilling, Completion and Testing of Sour Gas Wells.**
Available from: Canadian Petroleum Association, Calgary.

44. Canadian Petroleum Association. **Sulphur Handling Guide, 1983.**
Available from: Canadian Petroleum Association, Calgary.

45. Canadian Petroleum Association. **A Feasibility Study of Air Sparging Systems for the Prairie Region.**
Available from: Canadian Petroleum Association, Calgary.

46. Canadian Petroleum Association. **Air Bubble Diverter.**
Available from: Canadian Petroleum Association, Calgary.

47. Canadian Petroleum Association. **Oil Recovery from Under Ice.**
Available from: Canadian Association Petroleum Association, Calgary.

48. Canadian Petroleum Association. **An Introduction for Field Personnel to the Effects of Oil Spills on Soil and Some General Restoration and Cleanup Procedures.**
Available from: Canadian Petroleum Assoication, Calgary.

49. Canadian Petroleum Association. **Oil Spill Cleanup and Site Reclamation, Edition II.**
Available from: Canadian Petroleum Association, Calgary.

50. Canadian Petroleum Association. **Field Manual: Information and Action Regarding Saltwaters and Related Spills in Saskatchewan Oil Fields.**
Available from: Canadian Petroleum Association, Calgary.

51. Canadian Petroleum Association. **Recommended Practice for Liquid Petroleum Pipeline Leak Prevention and Detection in the Province of Alberta.**

Available from: Canadian Petroleum Association, Calgary.

52. Canadian Petroleum Association. **Gas Processing Plant Sludge Characterization: An Information Review**

Available from: Canadian Petroleum Association, Calgary.

53. Clay, C.H. 1961. **Design of Fishways and Other Fish Facilities. Department of Environment, Ottawa, Out of Print.**

54. Curran, H.J.B. 1976. **Environmental Design for Northern Road Developments. Environmental Impact and Assessment Report EPS-8-EC-76-3.**

Available from: Supply and Services Canada, Ottawa.

55. Department of Indian Affairs and Northern Development, 1975. **Land Use Handbook, Guidelines to Assist in the Application of the Territorial Land Use Regulations.**

Available from: Department of Indian Affairs and Northern Development, Northern Natural Resources and Environmental Branch, Ottawa.

56. Earth Sciences Division. **Groundwater Reports and Bibliography.**

Available from: Alberta Environment, Earth Sciences Division, Edmonton.

57. Energy Resources Conservation Board. **The ERCB Public Hearing Process, G-16.**

Available from: Energy Resources Conservation Board, Edmonton.

58. Energy Resources Conservation Board. **Blowout Prevention Review Committee Progress Reports.**

Available from: Energy Resources Conservation Board, Edmonton.

59. Energy Resources Conservation Board. **Minimum Requirements for Blowout Prevention Equipment.**

Available from: Energy Resources Conservation Board, Edmonton.

60. Energy Resources Conservation Board. **Guidelines on the Use and Acceptability of Oil Spill Dispersants.**

Available from: Energy Resources Conservation Board, Calgary.

61. Energy Resources Conservation Board. **Lodgepole Blowout Inquiry - Phase 2 Sour Gas Well Blowouts in Alberta; Their Causes and Actions Required to Minimize Their Future Occurances.**

Available from: Energy Resources Conservation Board, Edmonton.

62. Energy Resources Conservation Board. **ENERFAX Fact Sheet #2.**

Available from: Energy Resources Conservation Board, Edmonton.

63. Energy Resources Conservation Board. **Lodgepole Blowout Inquiry - Phase 1 and Addendum.**

64. Environment Canada, 1977. **Recommended Environmental Code for Gas Pipeline Development. Regulations, Codes and Protocols, Report EPS-1-EC-77-1.**

Available from: Environment Canada, Ottawa.

65. Environmental Council of Alberta. **Environmental Impact of Surface Mining in Alberta.**

Available from: Environmental Council of Alberta, Library, Edmonton.

66. Environment Council of Alberta. **Environmental Effects of Sulphur Extraction Gas Plants in Alberta.**

Available from: Environment Council of Alberta, Library, Edmonton.

67. Environmental Protection Services. **Gas Plants, Waste Water Management Standards.**

Available from: Environmental Protection Services, Alberta Environment, Edmonton.

68. Environmental Protection Services. **Guidelines to the Environmental Aspects of Decommissioning Industrial Sites, 3rd Draft.**

Available from: Alberta Environment, Environment Protection Service, Environment Protection Programs, Edmonton.

69. Explosives Branch. **The Rules of Storage and Transportation of Explosives by the Seismic Industry.**

Available from: Energy, Mines and Resources Canada, Explosives Branch.

70. Explosives Branch. **Blasting Explosives: A Guide to Safety.**

Available from: Energy, Mines and Resources Canada, Explosives Branch.

71. Explosives Branch. **Blasting Explosives and Detonators.**

Available from: Energy, Mines and Resources Canada, Explosives Branch.

72. Fisheries and Environment Canada, 1977. **Recommended Environmental Stipulations for the Proposed Alaska Highway Gas Pipeline (Interim Report), EPS-1 PR-77-1.**

Available from: Fisheries and Environment Canada, Ottawa.

73. Groundwater Information Section. **Central Groundwater Data Manual File.**

Available from: Alberta Environment, Groundwater Information Section, Edmonton.

74. Husky and Esso Resources. **Field Manual for Treating Salt Water Contaminated Soil.**

Available from:

75. Imperial Oil Limited Production Research and Technical Service Laboratroy, 1974. **State of the Art Review of Petroleum Product Spill Containment Dykes in the North.**

Available from: Environment Canada, Environmental Protection Service, Environmental Emergency Branch, Ottawa.

76. Land Conservation and Reclamation Council. **Guidelines for the Reclamation of Land in Alberta.**

Available from: Alberta Environment, Land Conservation and Reclamation Council, Edmonton.

77. Land Reclamation Division. **Information Requirements for Regulated Pipelines, 1982.**

Available from: Alberta Environment, Land Reclamation Division, Edmonton.

78. Land Reclamation Division. **Sand and Gravel Manual - How to Apply for a Development and Reclamation Approval - Draft.**

Available from: Alberta Environment, Land Reclamation Division, Edmonton.

79. Land Reclamation Division. **Environmental Handbook for Pipeline Construction.**

Available from: Alberta Environment Library or Land Reclamation Division.

80. Land Reclamation Division. **Guidelines for the Reclamation of Land in Alberta.**

Available from: Alberta Environment, Land Reclamation Division, Edmonton.

81. Land Reclamation Division. **Preparation of Development and Reclamation Applications for Pipeline Projects - Draft.**
Available from: Alberta Environment, Land Reclamation Division, Edmonton.

82. McGeague, ed 1978. **Manual on Soil Sampling and Methods of Analysis.**
Available from: Alberta Environment, Land Reclamation Division, Edmonton.

83. Petroleum Association for Conservation of the Canadian Environment. **Oil Spill Training Exercise - Guidelines for Inland Waters.**
Available from: Petroleum Association for Conservation of the Canadian Environment, or Canadian Petroleum Association, Calgary.

84. Petroleum Industry Training Service, 1979. **Environmental Lease Management Seminar.**
Available from: Petroleum Industry Training Service, Edmonton, or Calgary.

85. Petroleum Industry Training Service. **Oil Spill Containment and Recovery: A Primer.**
Available from: Petroleum Industry Training Service, Edmonton, or Calgary.

86. Petroleum Industry Training Service. **Oil Spill Containment and Recovery: Short Course Manual.**
Available from: Petroleum Industry Training Service, Edmonton, or Calgary.

87. Planning Division. **Water Resource Management Principles for Alberta.**
Available from: Alberta Environment, Planning Division, Edmonton.

88. Pollution Control Division. **Nitrogen Oxides Emission for Alberta.**
Available from: Alberta Environment, Pollution Control Division, Edmonton.

89. Pollution Control Division. **Air Monitoring Directive AMD 86-1, Alberta Environment.**
Available from: Alberta Environment, Pollution Control Division, Edmonton.

90. Pollution Control Division. **Rural Air Quality Monitoring Computer File.**
Available from: Alberta Environment, Pollution Control Division, Edmonton.

91. Pollution Control Division. **Urban Air Quality Monitoring Computer File.**
Available from: Alberta Environment, Pollution Control Division, Edmonton.

92. Regulated Operations Branch. **Supplementary Information for Pipeline Applications.**
Available from: Alberta Environment, Regulated Operations Branch, Edmonton.

93. Sask-Alta Waste Disposal Cooperative. **Waster Disposal Guidelines.**
Available from: Sask-Alta Waste Disposal Cooperative, Husky Oil Operations Ltd., Lloydminister.

94. Standards and Approvals Division. **Guidelines for Design and Operation of Refuse Incinerators in Alberta.**
Available from: Alberta Environment, Standards and Approvals Division, Air Quality Branch, Edmonton.

95. Standards and Approvals Division. **Guidelines for the Disposal of Sulphur Containing Solid Wastes.**
Available from: Alberta Environment, Standards and Approvals Division, Edmonton.

96. Standards and Approvals Division, 1985. **Workshop on Industrial Site Decommissioning Cleanup and Reuse.**

Available from: Alberta Environment, Standards and Approvals Division, Industrial Waste Management Branch, or Environment Canada, Edmonton. Lands and Wildlife, Edmonton.

97. Standards and Approvals Division. **Guidelines for Plume Dispersion Calculations.**

Available from: Alberta Environment, Standards and Approvals Division, Edmonton.

98. Toogood, J.A., 1977. **The Reclamation of Agricultural Soils After Oil Spills Part 1: Research. Alberta Institute of Pedology Publication No. M-77-11.**

Available from: Department of Soil Science, The University of Alberta, Edmonton.

99. United States Environmental Protection Agency, 1981. **Compilation of Air Pollutant Emission Factors, Publication AP-2.**

Available from: United States Environmental Protection Agency.

100. Water Resources Administration Division **Groundwater Allocation Policy for Oilfield Injection Purposes.**

Available from: Alberta Environment, Water Resources Administration Division, Edmonton.

101. Water Resources Administration Division **Groundwater Projects: How to Obtain a Licence or Permit.**

Available from: Alberta Environment, Water Resources Administration Division, Edmonton.

102. Water Resources Administration Division **Surface Water Projects: How to Obtain a Licence or Permit.**

Available from: Alberta Environment, Water Resources Administration Division, Edmonton.

ERCB Documents

INTERIM DIRECTIVES

ID	70-4	Post-Hearing Meetings
ID-OG-PL	75-1	Spill Contingency Planning
ID-OG	75-2	Sump Fluid Disposal Requirements
ID-OG	76-2	Emergency Procedure Plans for Sour Gas Facilities
ID	80-2	Noise Control Guidelines
ID	81-1	Subsurface Disposal of Drilling Fluids
ID	81-3	Minimum Distance Requirements Separating New Sour Gas Facilities from Residential and Other Developments
ID	81-4	Proposed Wells and Pipelines Near Urban Centres
ID	82-3	Well Licence Application - Early Information for Landowners (Revised)
ID	84-1	Gas Meters: Calibration and Protection
ID	84-	Blow out Prevention at Sour Wells (Draft dated 25 Apr 1984)
ID	85-1	Pipeline Permit and Licence Applications
ID	85-2	Changes to Pipline Application and Approval Procedures
ID	85-3	Regulations and Procedures to Accommodate Supplementary Oil Sales
ID	85-4	Zama Lake Area: Special Requirements Regarding Waterfowl Migration
ID	86-1	Revised Regulations Overproduction Penalties and Supplementary Sales Program
ID	87-1	Modification of the Plan for Proration of Oil to Market Demand in Alberta
ID	87-2	Sour Well Licensing and Drilling Requirements
ID	87-3	Temporary Well License Surcharge

INFORMATIONAL LETTERS

IL	70-16	Oil Pools Underlying Provincial Boundaries
IL	71-15	Placing of Crude Oil Pools on Good Production Practice
IL-OG	71-20	Environmental Management and Pollution Control Gas Processing Operations
IL-OG	73-12	Allowable Penalties Pools Having a Single Well, Block, or Project; and Confidential Pools
IL-OG	73-33	Use of Chemical Oil Spill Treating Agents for Oil Spill Clean Up;
IL-OG	74-9	Water-Oil Ratio Penalty Relief - Amber, Larne, Virgo, and Zama Fields
IL-C	75-1	(cage gear safety)
IL-C	75-4	Personnel Safety Measures Around Draglines, Shovels, and Bucket Wheels
IL-OG-PL	75-8	Spill Training Exercises
IL-OG	75-9	Gas Well Testing Milk River Formation, Medicine Hat Zone, and Second White Specks Zone
IL-OG	75-13	Measurement and Accounting of Production of Milk River, Medicine Hat, and second White Specks Gas Wells in the Fields and Areas Outlined in Appendix I
IL-C	76-9	Braking Performance Standards for Off-Highway Vehicles
IL-OG	76-14	Drilling Cuttings and Core
IL-OG	76-17	Incinerator Stack Surveys
IL-OG	76-23	Policy on Establishing Crude Oil Reserve Estimates, Recovery Factor Modifiers, and Maximum Rate Limitations
IL-OG	76-24	Stack Exit Temperatures for Acid Gas Incinerators Associated with Gas Processing Plants
IL-OG	78-12	Policy on Experimental Schemes - Conventional Oil Pools or Oil Sands
IL	79-16	Revised Incinerator Stack Exit Temperature Criteria for Plants Processing Sour Gas
IL	79-22	Revised Environmental Monitoring Requirements for Plants Processing Sour Gas
IL	79-24	Pembina Nisku Basin Commencement of Enhanceed Recovery Schemes
IL	79-25	Applications Under The Gas Resources Preservation Act for the Removal of Gas from Alberta
IL	80-1	Development of Deep-Basin Multi-Zone Gas Production
IL	80-2	Sampling of Reservoir Fluids
IL	80-10	Procedures and Economic Criteria for the Assessment of Future Alberta Gas Trunk Line Applications
IL	80-11	Joint Use of Right of Way
IL	80-22	Industrial and Manufacturing Operations Statement

IL	80-23	Experimental Schemes - Release of Application and Basic Well and Geolgical Records - Confidentiality Provision for Unique Design Data and Progress Reports on Operating Results - Requests for Information of Local Interest
IL	80-24	Sulphur Recovery Guidelines Gas Processing Operatings
IL	80-30 (Amendment)	Application for Approval of Natural Gas Compressors
IL	80-30	Application for Approval of Natural Gas Amendment Compressors
IL	81-7	Exploration for and Production of Sour Gas in the Calgary-Okotoks Region
IL	81-10	Disposal of Campsite and Well Site Waste
IL	81-16	Deep-Drilling Permits
IL	81-21	Standard Unit of Measurement for Ethane
IL	81-22	Underground Fire Fighting
IL	81-23	Drilling Spacing Unit and Target Area Requirements
IL	81-24	Oilfield Solution Gas Conservation
IL	81-30	Experimental Schemes Involving a Large Array of Wells and Close Well Spacing
IL	82-1	Well Licence Application - Coal Field Areas
IL	82-4	Drilling Spacing Units and Target Areas Requirements Clarified
IL	82-11	Preservation of Archaeological, Palaeontological, and Historical Resources: Policy Update
IL	82-12	Mine Safety Accord Established
IL	82-13	Off-Target Penalty Factors for Exploration Wells
IL	82-14	A Summary of Policies and Procedure Respecting Well Spacing Provisions and Means to Vary Them
IL	82-18	Procedure for Processing Coal Mine Permit Applications
IL	82-20	New Conventional Heavy Oil Developments Choice of Target Pattern for Small Spacing
IL	82-23	Gas-Well Testing - Co-ordinating Operators and their Duties Southeastern Alberta - Milk River Formation Medicine Hat Zone, and Second White Specks Zone
IL	83-1	Reservoir Limit Tests on Discovery Oil Wells: A Guide
IL	83-2	Procedure for Submission: Annual Reservoir Review for Gas Pools
IL	83-3	Oilfield Solution-Gas Conservation: Flaring Limited Review
IL	83-6	Release of Coal Drillhole Information Revised Policy
IL	83-10	Disposal of Oil Field Waste
IL	83-11	Common Gas Purchaser and Related Matters Oil and Gas Conservation Act: Regulation Changes and Clarification of Board Policy
IL	83-13	Good Production Practice Status Conventional Heavy Crude Oil Pools
IL	84-1	Casing Cementing - Minimum Requirements ERCB Guide G-9 Revision

IL	84-6	Mined Oil Sands Bitumen Processing Technology
IL	84-7	Declaration of Oil Sands Areas to Facilitate Orderly Leasing and Stable Regulation
IL	84-9	Completion and Servicing of Sour Wells
IL	84-10	ERCB Mailing List Policy
IL	84-11	Approval, Monitoring, and Control of Sulphur Storage Sites
IL	84-12	Surface Casing and Logging Requirements-New Disposal and Injection Wells
IL	85-2	Leak Prevention and Detection
IL	85-3	Operational Use of Flare Guns Forested Public Lands
IL	85-8	Determining Water Production at Gas Wells Revisions to ERCB Guide G-4
IL	85-9	Release of Coal Analyses to the Public
IL	85-10	Maximum Daily Rates of Production for Gas Wells
IL	85-11	Exploratory Gas Wells Drilled Under the Natural Gas Royalty Amendment Regulation
IL	85-12	Oil Sands Primary Production: Well Spacing Primary Recovery Scheme Approvals
IL	85-14	Supplementary Oil Sales Under Alberta Prorationing System
IL	85-15	Sour Gas Wells
IL	85-16	Storage, Handling, and Disposal of Oily Wastes
IL	85-17	Method of Processing and Requirements of the ERCB for Interim Information in Support of Applications for Removal of Small Volumes of Gas from Alberta
IL	86-1	Well Licence Deposits
IL	86-2	Criteria for the Exemption of Sweet Gas Processing Plants from approval Requirements under the Clean Air Act and the Clean Water Act
IL	86-3	Automated Measurement Systems
IL	86-4	Classification of Wells Drilled for Oil and Gas in Alberta
IL	86-6	Management of Supplementary Crude Oil Sales
IL	86-8	Release of Results of Special Tests Made on Coal
IL	86-9	Approval Procedures for Single Well Steam Stimulation Tests in Oil Sands Areas
IL	86-10	Update Respecting Gas Removal Matters
IL	87-1	Compressibility Factors Used in Gas Volume Calculations and Physical Property Data for Natural Gases
IL	87-2	Modified Proration Plan/Guidelines for Forecasting Crude Oil Deliveries
IL	87-3	Suspending Application of Water Oil Ratio Penalty Schedules
IL	87-4	Revised New Oil Well Production Rate Administration
IL	87-5	1987 Administration Fee on Wells and Oil Sands Projects
IL	87-6	Assessment of Gas Processing Capacity Requirements-West Edmonton Area.

IL	87-7	Need for Prompt and Accurate Filing of Daily Drilling and Servicing Records
IL	87-8	Emergency Response Plans for Sour Gas Facilities
IL	87-9	Revised Procedures for Oil Production Allowable Controls and New Oil Well Production Period
IL	87-10	Modified Proration Plan
IL	87-11	Recognition of Changes in MRL Modified Proration System
IL	87-12	Horizon Wells-Conventional Oil and Gas Pools

GENERAL BULLETINS

GB	86-1	New Pipeline Application and Information System
GB	86-2	Annual Review of Crude Oil Reserves
GB	86-3	Revision of S-4 Form for Notice of Commencement or Suspension of Production or Injection at a Well
GB	86-4	Development Department - Field Operations Personnel Change, Wainwright Area Office
GB	86-5	Single Well - Single Cycle Steam Stimulation Tests in Oil Sands Areas
GB	86-6	Interim Directives, Informational Letters, and General Bulletins - Current List
GB	86-7	ERCB Monthly Prorationing Statistics
GB	86-8	Review of Gas Well Testing Requirements Southeastern Alberta Shallow Gas Pools
GB	86-9	Pressure Transient Analyses
GB	86-10	Winter Drilling and Servicing Operations
GB	86-11	Telephone Number Change Wainwright Area Office
GB	86-12	ERCB Office Hours Christmas and New Year's Holidays Well Licensing Schedule
GB	86-13	1987 Provincial Program of Subsurface Pressure Surveys and Deliverability Testing for Gas Pools

APPENDIX G

CONCORDANCE

(KEY WORD INDEX)

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	ABANDONMENT			
2.5.1.1, 8.4,8.10.2 Table 2.1	oil sands site - Development & Reclamation approval required.			
2.5.1.1, 8.10	report abandonment of oil sands site to Chairman of Reclamation Council	A.1.15 (D)	8	17
6.3.6, 8.4	of a pipeline - Development and Reclamation certificate required	A.1.15 (E)	1	2(2)
4.3.11, 8.4	of a well			
4.3.12	dispose of liquid waste and debris on abandonment of a well or a battery	A.1.19 (A)	15	8.150(5)
	ACCESS			
2.7	permits			
2.7	on private roads			
8.1.2, 8.13	selection of right-of-way			
8.1.3	design,construction guidelines			
3.3.1, 5.3.1, 6.3.1	width considerations			
	ACTS AND REGULATIONS			
2.0	general			
2.1	administration of			
	AE (ALBERTA ENVIRONMENT)			
2.5, Figure 2.3	organization			
2.1, 2.5	functions and responsibilities			
	AEn (ALBERTA ENERGY)			
2.4 Figure 2.2	organization	A.1.5	1	2
		A.1.5	2	8
		A.1.5	3	9
		A.1.5	4	10

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
2.1, 2.4	functions and responsibilities	A.1.5	5	13(1)(2)
	AFLW (ALBERTA FORESTRY, LANDS AND WILDLIFE)			
2.3 Figure 2.2	organization	A.1.7	1	2
2.1, 2.3	functions and responsibilites			
	AGRICULTURE			
2.0	Agricultural Chemicals Act	A.1.1		
2.6	Airports			
	AIR QUALITY			
5.3.9, Table 5.2	objectives			
5.3.9	emission rates			
5.3.9	monitoring			
5.3.9	stack heights			
	ALBERTA GOVERNMENT (JURISDICTION MAPS)			
2.8	description of maps			
	ALIGNMENT			
3.3.1	seismic			
5.3.1	production facilities			
6.3.1	pipelines			
	ALTER			
	a plant, permit required	A.1.3 A.1.4	3 3	5(1) 5(1)
	construction of a plant, permit required	A.1.4 (B) A.1.3(A)	3 3	14(1) 13(1)
	operation of a plant, amendment required	A.1.3 (A) A.1.4(B)	4 3	18(1) 14(1)

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	operation of an oil sands site. Development & Reclamation Approval required	A.1.15 (D)	1	3(3)
	a pipeline. Development & Reclamation approval required	A.1.15 (E)	1	2(2)
	AMENDMENT			
	to a permit/licence for the	A.1.3 (A)	3	13(1)
	operation of a plant	A.1.3 (A)	4	18(1)
	ANTIFREEZE			
6.3.2.6	use in hydrostatic testing			
	ANTI-LITTER ORDER			
	issuance	A.1.16	8	7(3)
	form	A.1.16	Form A	
	APPEAL			
	Stop Order for construction or	A.1.3	7	14(7)
	operation of a plant	A.1.4	4	15(7)
	Stop Order - Form A	A.1.3 (B)		
	Ministerial Stop Order	A.1.6	1	17(17)
	Stop Order - Land Surface Conservation and Reclamation Act	A.1.15	1	9(1)
	Reclamation order - or certificate	A.1.15	10	60(1)
	Reclamation Order - Court of Appeal	A.1.15	11	63
3.1, 8.4	Exploration Approval or Development & Reclamation Approval	A.1.15 (B)	8	35(1)
	APPLICATION			
8.1, 2.3.1.1, Figure 2.7	access roads			
	Exploration Approval Form 1 - oil sands	A.1.15 (D)	2	6(2)(a)
2.3.1.2, 3.1, 8.3, Figure 3.1	exploration (seismic or mineral)			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	Development & Reclamation approval Form 2 - oil sands	A.1.15 (D)	3	9(2)(a)
4.1, Figure 4.1	drilling			
2.5.1.1	Development & Reclamation	A.1.15 (F)	2	4(1)
Appendix D	license to divert water, Form 1			
5.3.10	required to divert water	A.1.26	2	5
5.1, Figure 5.1	production facilities			
5.1	for approval of a Plant	A.1.19 (A)	28	15.050
	for approval of underground storage	A.1.19 (A)	29	15.060
5.1, Figure 5.1	for construction approval of battery	A.1.19 (A)	30	15.210
2.9	procedures and referral systems			
2.5.1.2, 8.2 Figure 2.6	procedures for stream crossings			
2.5.1.1	RDA areas			
8.3, Table 2.3 Figure 8.3.2	sand and gravel, borrow pits			
5.1	sour gas processing			
6.1, Appendix D	for pipeline permit	A.1.22 (B)	1	2
5.1	for compressor station, oil pumping station or water injection station	A.1.22 (B)	2	3
	APPROVAL			
4.3.10, Tables 2.1 & 2.3	required for burning or open fires	A.1.3 (D) A.1.3 (D)	1 2	5 6
7.3.6, 8.7.7.3	required to deposit deleterious substance in a watercourse, surface water etc.	A.1.4	6	17(2)
7.1, 8.4	Development & Reclamation - oil sands	A.1.15 (D)	3	9(1)(2)(5)
	transfer of Exploration or Development & Reclamation - consent required	A.1.15 (B)	9	42(1)(2)

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
4.3.1	required to drill a well or construct a pit closer than 100m to a body of water	A.1.19 (A)	1	2.120
4.3.10, 5.3.7 5.3.9	required to burn waste at a plant, well or battery	A.1.19 (A)	5	7.040
5.3.9	required to discharge vapours containing sulphur compounds from a well or battery	A.1.19 (A)	8	7.070
5.3.7	required to dispose of waste material off well or battery site			
5.2 Tables 2.1 & 2.2 Figure 5.1	application for approval to construct or operate a plant	A.1.19 (A)	28	15.050
2.2	application for approval of underground storage	A.1.19 (A)	29	15.060
2.2, 5.2, Table 2.1 Figure 5.1	application for approval of a battery	A.1.19 (A)	30	15.210
3.2	exploration	A.1.18 (A)	9	9
	AQUIFERS			
Appendix B	data available			
4.3.8.1, 7.3.5	protection of, drilling			
	ARCHAEOLOGICAL			
Appendix B	information available			
6.2.1, 6.3.2.1	guidelines			
6.3.1	pipeline alignment			
	BATTERY			
5.3.6	firewall required	A.1.19 (A)	11	8.030
	disposal of produced water from	A.1.19 (A)	13	8.040
5.3.7	disposal of waste from	A.1.19(A)	1	2.120(2)
5.3.7, 8.10	disposal of waste material and debris upon abandonment or completion	A.1.19 (A)	18	8.150(5)
5.1, 5.2	approval for construction and	A.1.19 (A)	30	15.210

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
Tables 2.1 & 2.2 Figure 5.1	operation of			
5.3.9 Tables 2.1 & 2.2	gas emission control from	A.1.19 (A)	8	7.070
	BERMS			
	also see DYKES			
8.1	in road access construction			
4.3, 4.3.8	around drilling sites			
8.5	for erosion control			
	BIOLOGICAL			
Appendix B	environmental parameters			
	BIOPHYSICAL DATA			
Appendix B	types of			
Appendix B	biophysical analysis and capability reports			
	BLADDER			
3.3.8	for fuel storage			
	BLOW-OUT PREVENTION PLAN			
4.3.9	employee training			
4.3.9	regular maintenance			
4.3.9	testing control devices			
4.3.9	pressure detection and surges			
	BORROW PIT OPERATIONS			
8.3.1 Figure 8.3.1	environmental requirements			
	BRIDGES			
8.2	use of in stream crossings			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
8.2.2.1	permanent			
8.2.2.2 Figure 8.2.1	temporary			
8.2.2.3, Figure 8.2.2	ice			
8.2.2.4 Figure 8.2.3	fords			
8.2.2.5 Figure 8.2.4 Figure 8.2.5	corduroy and log fills			
8.2.2.6, Figure 8.2.6 to Figure 8.2.9	culverts			
8.2.2.7	for pipeline stream crossings			
	BUFFER ZONES			
3.3.1	seismic operations			
4.3.1	drilling			
8.1.3.1	access roads			
6.3.1	pipelines			
8.3.3	gravel or borrow pits			
	BURNING			
Table 2.1 Table 2.3 Appendix D	permit			
	prohibited without written approval (April 1 - Oct. 31)	A.1.3 (E) A.1.3 (E)	1 2	5 6
5.3.7	prohibited at plant, well or battery without approval	A.1.19 (A) A.1.19 (A)	5 8	7.040 7.070
3.3.3	of slash			
3.3.3	prevention of ground fires			
3.3.3	residual disposal after			
	CAMPS			
8.6.1	location and relocation of			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
8.6.1	and wildlife harassment			
8.6.4	solid waste disposal			
8.6.1	camp rules			
8.6.3	sewage effluent and wastewater treatment			
8.6.5	fuel storage and handling permits			
8.6.6	restoration			
	CANADA LAND INVENTORY MAPS			
Appendix B	availability			
	CASINGS			
4.3.8, 8.10.2	selection and safety requirements			
	CHEMICAL AND HERBICIDE HANDLING			
8.11	information			
	CIRCULATION TANKS			
4.3.5.1	use of liners			
4.3.5.2	well clean-out fluids			
	CLEAN AIR ACT			
2.0, 2.5	permit to construct	A.1.3	1	3(1)
Tables 2.1 & 2.4	licence to operate	A.1.3	2	4(1)
Figure 5.1				
Figure 2.8				
	CLEAN WATER ACT			
2.5	permit to construct	A.1.4	1	3
Tables 2.1 & 2.4	licence to operate	A.1.3	2	4(1)
Figure 5.1				
Figure 2.8				

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	CLEAN UP OPERATIONS			
	also see RECLAMATION			
4.3.12, 5.3.12, 8.4.3 6.3.2.8	for oil and gas industry pollution	A.1.12	1	29
6.3.3	of spills - pipelines	A.1.2.2	4	37(1)(2)(3)
	CLEAN UP ORDER			
	(Litter Act)			
	issuance of	A.1.16	10	9(1)
	form	A.1.16	Form B	
	CLEARING/CUTTING			
3.3.2	seismic			
4.3.2	drilling sites			
5.3.2	production facilities			
6.3.2.4	pipelines			
	for industrial use	A.1.13(A)	1	146-151
	CLIMATE AND METEOROLOGY			
Appendix B	information			
6.0, 7.0.	**COLLECTION PIPELINES**			
	COMMON CORRIDORS			
6.3.1	use of in pipeline alignment			
	COMMUNICATION			
Appendix A2	by-law requirements, municipalities			
Table 2.1, 6.3.2.2	with municipalities, townships, counties etc.			
2.10.2, 6.3.2.2	community and rural relations			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	COMPRESSORS			
5.3	environmental requirements			
5.1, Figure 5.1	application for permit to construct	A.1.22	2	3
	CONSENT			
	to transfer Exploration or Development & Reclamation approval	A.1.15 (B)	9	42(1)(2)
	CONSTRUCTION			
8.1.3	guidelines, access roads			
2.2.1, 5.1, 5.2 Tables 2.1 & 2.2 Figure 5.1	of a plant, permit required	A.1.3 A.1.3 (A) A.1.4 A.1.4 (B)	1 1 1 1	3(1) 3(1) 3(1) 4(1)
2.2.1	alter construction of a plant, permit required	A.1.3 (A) A.1.4 A.1.4 (B)	3 3 3	13(1) 5(1) 4(1)
6.1, 6.2, 8.4.1 Tables 2.1 & 2.4	of a pipeline - Development and Reclamation approval required	A.1.15 (E)	1	2(2)
2.2.1, 5.1 5.2 Tables 2.1, 2.2 Figure 5.1	of a battery, approval required	A.1.19 (A)	30	15.210
6.3.2	of pipelines, practices			
	CONTAMINATION			
8.2	of reservoir, surface water, or watercourse - prohibited	A.1.4	6	17(1)(2)
		A.1.4(A)	1	11(1)
	CONTINGENCY			
6.3.3, 8.9	planning			
5.3.12, 8.9	planning for production facility			
	emergency procedures manual	A.1.22(B)	6	50(1)(2)

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	CONTROL			
5.3.9	emissions at a gas processing plant	A.1.19(A)	26	9.050
	COUNTIES			
2.8	jurisdiction			
Appendix A2	by-law requirements			
	CULVERTS			
5.3.3	use in production facilities, batteries and gas plants			
8.2.2.6 Figure 8.2.6 to Figure 8.2.9	use in stream crossings			
8.2.2.6	installation			
8.2.2.6	types and users			
8.2.2.6	guidelines to protect fisheries resources			
8.2.2.6	in erosion control			
8.2.2.6	fish passage considerations			
	CUTLINES			
Table 3.2 3.1, 3.3.1	information (see seismic cutlines)			
	DAMAGE, COMPENSATION			
2.10	information			
	DEBRIS			
3.3.3	disposal techniqus and requirements, seismic operations			
4.3.2, 5.3.2	disposal of at well or battery site	A.1.19(A)	18	8.150(5)
	DEEP WELL INJECTION			
8.7.7.2	use of for liquid waste disposal			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
Table 2.2 Appendix D	application			
	DEPOSIT			
5.3.3, 7.3.6, 8.7.7.3	of deleterious substance in a watercourse prohibited without approval, permit or licence	A.1.4	6	17
5.3.3, 7.3.6, 8.7.7.3	of any sustance in a watercourse prohibited without permission	A.1.4(A)	1	11(1)
	DEVELOPMENT & RECLAMATION APPROVAL			
2.5, 8.4.1	appeal of	A.1.15(B)	8	35
2.5, 8.4.1	transfer and amendments to	A.1.15(B)	9	42
2.5, 8.4.1 Tables 2.1 & 2.4	required for operation, extension or abandonment of - oil sands site	A.1.15(D)	3	9(1)
8.4.1	application, Form 2 oil sands	A.1.15	Form 2	
6.1, 6.2, 8.4.1	required to construct, operate, alter or abandon a pipeline	A.1.15(E) A.1.15(E)	1 2	2(2) 4(1)
6.1, 8.4.1 Tables 2.1 & 2.4	application - pipeline	A.1.15(E)	2	4(1)
8.4.1.3	in situ projects			
8.4.2.1	seismic lines			
8.4.2.1, 8.1	access roads			
	DEVELOPMENT PLAN			
8.4.1	required for Development and Reclamation plan	A.1.15(B)	6	32(1)(2)
8.4.1.3, 7.2.2	Part 1 - required for Development and Reclamation approval - oil sands	A.1.15(D)	4	14
8.4.1.3, 7.2.2	Part 2 - required for Development and Reclamation approval - oil sands	A.1.15(D)	5	15
	exemptions from - oil sands	A.1.15(D)	6	10
6.3.6	Part 1 - required for Development and Reclamation approval - pipelines	A.1.15(E)	2	4(4)(a)
6.3.6	Part 2 - required for Development and Reclamation approval - pipelines	A.1.15(E)	2	4(4)(b)

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	DEVELOPMENT REPORT			
	required for Development and Reclamation	A.1.15(B)	1	25
8.4.1	Part 2 - oil sands application	A.1.15(D)	5	15
8.4.1	Part 2 - pipeline application	A.1.15(E)	3	6(1)(2)
	DIKE - see DYKE			
	DISCHARGE			
7.3.6, 8.7.7.3	of any substance in a watercourse, surface water, etc.	A.1.4 A.1.4(A)	6 1	17 11
5.3.8	of vapours containing sulphur compounds from well or battery	A.1.19(A)	8	7.070
	DISPOSAL			
8.7	defined	A.1.16	2	3
3.3.3, 4.3.2, 5.3.2, 6.3.3, 8.1.3, 8.4.2.1	of debris			
4.3.5	of drilling sump liquids			
	of litter on public land	A.1.16	3	2
	of litter on highways	A.1.16	4	3
	of litter on municipal land	A.1.16	5	4
	of litter on private land	A.1.16	6	5
	of litter in water or under ice	A.1.16	7	6
8.1.3	of timber in road construction			
8.6.3	of sewage at camp site			
8.7.7.2	of produced water from a well, battery or plant	A.1.19(A)	13	8.040
5.3.7	of waste material or debris on a well or battery site	A.1.19(A)	18	8.150
5.3.7.2	of wastewater from a plant			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
4.3.4, 4.3.5, 5.3.7, 8.7	hazardous waste (liquid and solid)			
8.7.7.2	by deep well injection			
	DISPOSITION			
2.1, 2.3.1	of public lands			
2.1,2.3.1 Table 2.1 Table 2.3	leases and permits required			
	DITCHES			
4.3.4, 4.3.5	sumps			
8.1.3, 8.7.7.3	roads, drainage			
	DIVERT			
	defined	A.1.26	1	(f)
2.5.1.2, Table 2.0	water - permits and licences	A.1.26	2	5
Table 2.4, 2.5.1.2 Appendix D	application for licence to divert water, Form 1			
	DRAINAGE			
2.5.1.2 Tables 2.1 & 2.4 Appendix D	permit			
8.1.3	of access roads			
8.1.3 8.4.1.2, 8.5	techniques for erosion control			
5.3.3	of production facilities, plants and batteries			
	DRILLING			
4.0	general			
4.1	application procedures			
4.2, 2.2.1 Tables 2.1 & 2.2	permits, approvals and licences			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
4.3.1	site selection			
4.3.1	equipment spacing			
4.3.1	lease layout			
4.3.4	liquid and solid waste disposal			
4.3.5	sump construction (fluid, location, disposal)			
4.3.5	fluid control			
4.3.1, Table 2.2	spacing unit permit			
4.3.8	groundwater			
4.3.9	spill prevention			
4.3.9	blowouts			
4.3.12	rig dismantling and site completion			
4.3.13	reclamation			
4.3.14	noise control			
	DYKE			
5.3.3, 5.3.6	construction			
4.3.3, 5.3.3, 5.3.6, Figure 3.3	use of in storage areas	A.1.19(A)	11	8.030
	EARP PROCESS (ENVIRONMENTAL ASSESMENT AND REVIEW PROCESS)			
2.6	information			
	EASEMENT			
Table 2.3	for power lines			
	EASTERN SLOPES			
Appendix B, 3.3.2	proponent awareness			
	ECOLOGICAL LAND CLASSIFICATION AND EVALUATION REPORTS			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
Appendix B	availability			
	ECOLOGICAL RESERVES			
Appendix B, 3.1	administration			
	EMERGENCY PROCEDURES			
4.3.9.1	for uncontrolled releases of contaminants	A.1.19(A)	27	9.060
6.3.3	manual for pipelines	A.1.22(B)	6	50(1)(2)
	(also see contingency plans)			
	EMISSIONS			
5.3.9, 7.3.3	control at a plant	A.1.19(A)	26	9.050
	emission control orders	A.1.3	6	13(1)
	ENDANGERED SPECIES			
Appendix B	information			
	ENVIRONMENTAL			
1.0 - 2.0	operating guidelines (introduction & contents)			
Appendix B	parameters			
2.5.1, 7.2.1	environmental impact assesment (EIA)			
Appendix B	inventory maps			
	ENVIRONMENTALLY UNIQUE AREAS			
Appendix B	identification			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	ERCB (ENERGY RESOURCES CONSERVATION BOARD)			
	act	A.1.9		
2.2 Figure 2.9	organization			
2.2	powers	A.1.9	3	32
2.2	functions and responsibilities			
2.2	departments			
2.8, Figure 2.9	area offices			
Appendix F	list of IL's and ID's			
2.10.1	hearings	A.1.9	2	29(1)(2)(3)
	EROSION			
8.5	definition			
8.5.1	factors affecting			
8.5.1	types of			
8.5.1	effects of			
8.5.2	control techniques			
6.3, 6.3.2.5	pipelines			
3.3.5	seismic lines			
	EVAPORATION			
Appendix B	data			
	EXEMPTIONS			
	from Development Plan, oil sands Development and Reclamation approval	A.1.15(D)	6	10
	from application to transport dangerous goods in a vehicle	A.1.18	1	4(1)
	EXPLORATION			
3.1, 3.2 Tables 2.1, 2.3 & 2.4	approvals required - geophysical	A.1.18(a) A.1.18(A)	9 11	9 11(1)(2)

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
3.0	defined	A.1.18(A)	1	1
3.2, Tables 2.1, 2.3 & 2.4	licence required - geophysical	A.1.18	2	151
		A.1.18(A)	7	7
	penalty for contravention of approval	A.1.18(A)	6	6
3.2, Tables 2.1 Tables 2.3 & 2.4	permits required - geophysical			
	permits required - use or divert water	A.1.26	3	15
3.3	restrictions	A.1.18(A)	3	3
		A.1.18(A)	4	4
		A.1.18(A)	5	5
3.3	use of public lands	A.1.18(A)	39	39
		A.1.18(A)	40	40
3.3	use of forest lands	A.1.18(A)	41	41
		A.1.18(A)	42	42
3.3	highway and public roads	A.1.18(A)	43	43
		A.1.18(A)	44	44
		A.1.18(A)	45	45
		A.1.18(A)	46	46
		A.1.18(A)	47	47
3.3.1	restricted areas	A.1.18(A)	50	50
3.3	specific environmental guidelines			
	EXPLORATION APPROVAL			
3.2	appeal of	A.15(B)	8	35(1)
	transfer of and amendments to - consent required	A.1.15(B)	9	42(1)(2)
7.2	required for oil sands exploration	A.1.15(D)	1	3(2)
	application Form 1 - oil sands	A.1.15	Form 1	
		A.1.15(E)	2	6(2)(a)
3.1, 3.2 Tables 2.1, 2.3 & 2.4	geophysical	A.1.18	1	150
	exemptions from	A.1.18(A)	2	2

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	EXPLOSIVES			
3.3.9	use and restrictions			
3.3.9 Table 3.2	near water bodies, wells			
	FEDERAL GOVERNMENT			
2.6	Acts and Regulations			
	FENCES			
5.3.4	around compressor stations, gas plants, batteries	A.1.19(A) A.1.19(A)	20 21	8.170 8.180
	FERTILIZERS			
8.4.3	use on oil contaminated soils			
8.4.4.1	use of for revegetation			
	FILL MATERIAL			
6.3.2.5	use of in pipeline construction			
	FILLER MATS - see GEOTEXTILES			
	FIREARMS			
8.6.1	use of			
8.6.1	disturbance to wildlife			
	FIRES			
	approval required for - (see **BURNING**)	A.1.3(D) A.1.3(D)	1 2	5 6
8.9	prevention, contingency plans, fire fighting crews			
5.3.11, 8.9	equipment required	A.1.10	4	26(1)
8.9	fuel storage and electrical grounding			
	Fire Protection Act	A.1.10		

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	FIREWALL			
5.3.6	required around battery	A.1.19(A)	11	8.030
	FISHERIES			
2.3.1.4	Fish and Wildlife Division			
3.3.7	and exploration activities			
4.3.6	and drilling activities			
5.3.4	and production facilities			
2.0	the Federal Fisheries Act	A.1.11		
6.3.2.3 6.3.2.4	and pipeline activities			
8.2	critical time periods			
8.2.2.6	production information available			
3.3.6, 8.2	stream crossings - seismic			
6.3.2, 8.2.2.7	stream crossings - pipelines			
8.2	stream crossings - general			
Table 8.2.3	spawning periods of various Alberta fishes			
	FLARE STACKS			
4.3.10 5.3.5	design			
4.3.10	guidelines			
4.3.10	flaring (testing and completion)	A.1.19(A)	7	7.060
4.3.10	pilot light	A.1.19(A)	7	7.060
	FLARING			
4.3.10	well testing			
4.3.10	application for, sour gas	A.1.19(A)	31	15.240
	FLUID INFLUX			
4.3.9	detection and control while drilling			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	FORDS			
8.2.2.4	construction guidelines			
	FOREST			
Figure 2.10	Ranger District Map			
2.0	Forest Act	A.1.13		
2.0	Forest and Prairie Protection Act	A.1.12		
	FORESTRY			
3.3.2, 4.3.2, 5.3.2, 6.3.2.4	guidelines			
2.3	service of AFLW			
	FUEL			
3.3.8, 4.3.3, 8.6.5, 8.4	storage and handling			
3.3.8, 4.3.3, 8.6.5	handling, site locations, buffer zones, containment dykes			
8.6.5	campsites			
	FUEL SPILLS			
3.3.8, 4.3.3, 8.7.1, 8.7.2, 8.4	reporting, containment, clean-up			
	GAS PLANT - see PLANT			
	GEOLOGY			
Appendix B	provincial maps			
	GEOPHYSICAL EXPLORATION			
3.0	defined	A.1.18	1	150
2.3.1.2, 3.2	licence (See **EXPLORATION**)	A.1.18	2	151

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	GEOTECHNICAL ENGINEERING REPORT			
	required for Development and Reclamation plan	A.1.15(B)	3	27
7.2.1	required for Part 2 - oil sands D & R application	A.1.15(D)	3	9(5)(b)
6.3.1	required for Part 2 - pipeline D & R application	A.1.15(E)	2	4(4)(b)
	GEOTEXTILES			
8.1.1 8.5	utilization			
	GRAVEL AND BORROW PITS			
8.3 Figure 8.3.1	application process			
8.3	general			
2.5.1.1, 8.3 Table 2.1, 2.3	permits, licences and approvals			
8.3.3, 8.4	development and Reclamation approval			
	GRAZING			
2.3.1.1, Appendix B	reserves			
2.3.1.2	**GREEN AREA**			
	GROUNDWATER			
2.5.1.2, Tables 2.1 & 2.4	permits	A.1.14		
4.3.8, 7.3.5	protection of			
8.4, Appendix B	aquifers			
	management report - required for Development and Reclamation Plan	A.1.15(B)	5	29(1)(2)

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	HABITAT PROTECTION			
3.3.7, 4.3.6 5.4.3, 6.3.1 8.2.2.8, 6.3.2.3	timing construction scheduling			
	HAZARDOUS WASTE			
4.3.5.2, 5.3.7 8.7	disposal			
	HERBICIDES			
8.11	handling			
2.5.1.3, 8.11 Tables 2.1 & 2.4	permit	A.1.1	1	5(1)
	HEAVY OIL			
7.0	in situ facilities			
	HISTORICAL RESOURCES			
Table 2.1	permit	A.1.2	1	33(3)
	preservation of or development of site	A.1.2	1	33(2)
Appendix B	location of			
	HYDROGEN SULPHIDE			
5.3.8	conversion of at a plant	A.1.19(A)	26	9.050
	HYDROSTATIC TESTING			
6.3.2.6	of pipelines			
6.3.2.6	water use			
6.3.2.6	disposal of effluent			
	ICE BRIDGES			
8.2.2.3 Figure 8.2.2	information			
	IMPROVEMENT DISTRICTS			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
Appendix A2	by-laws and requirements			
	INCINERATORS			
8.7.7.4	information			
	INDIAN AFFAIRS (FEDERAL)			
2.6	jurisdiction			
	INFRASTRUCTURE			
Appendix B	existing in Alberta			
Appendix B	maximizing use of			
	INITIAL ENVIRONMENTAL INVESTIGATION (IEI)			
2.3.1.1 Appendix D Table 2.1, 2.3	exploration, drilling, production, and pipelines			
	IRRIGATION			
Appendix B	existing infrastucture			
	JURISDICTIONS			
2.8	maps of			
3.2, 4.2 5.2, 6.2, 7.2	exploration, drilling, production, pipeline, in situ activities			
	LAND DISPOSITIONS (PUBLIC LANDS)			
2.3.1 Table 2.1, 2.3	Public Lands Act	A.1.25		
	LAND USE			
Appendix B	evaluation of capability			
Appendix B	maps available (inventories)			
2.3.1.1	Forest Land Use Branch of AFLW			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	LAND RECLAMATION DIVISION			
2.5.1.1, 8.4				
	LANDFILL WASTE			
8.7.7.3	site location			
	LEASES - DRILL SITES			
4.3.1	selection of			
Table 2.1	permits			
	LICENCE			
3.2,	application for exploration licence	A.1.18(A)	7	7
Tables 2.1 & 2.4		A.1.18(A)	8	8
5.2	operation of a plant	A.1.3	2	4(1)
Tables 2.1 & 2.4		A.1.4	2	4(1)(2)
		A.1.4(B)	2	8(1)
		A.1.19(A)	24	9.030(2)
8.7.7.3, Table 2.4	to deposit deleterious substance in a watercourse	A.1.4	6	17
2.5.1.2 Table 2.4 Appendix D	to divert water	A.1.26	2	5(1)
Table 2.1	list of licences, permits and approvals potentially required for development			
3.2	required - for geophysical explorations	A.1.18	2	151
	LINE OF SIGHT			
3.3.1, 8.1	in alignment of right-of-way			
	LIQUID WASTE			
4.3.5, 5.3.7, 8.7	defined			
4.3.5, 5.3.7	disposal of at well or battery site	A.1.19(A)	15	8.150(2)
8.7		A.1.19(A)	15	8.150(5)
4.3.5.1	containment of at well site	A.1.19(A)	15	8.150(3)

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
8.6.3, 8.7	disposal of at a camp			
	LITTER			
	Act	A.1.16		
8.6.4, 8.7	defined	A.1.16	1	1(d)
	on public land	A.1.16	3	2
	on highways	A.1.16	4	3
	on municipal land	A.1.16	5	4
	on private land	A.1.16	6	5
	in water or ice	A.1.16	7	6
	MANDATE			
2.2, 2.3, 2.4 2.5	of ERCB, Alberta Energy and Natural Resources, Albertal Environment			
	MAPS			
2.8	jurisdictions			
Appendix B	environmental data			
Appendix B	various maps available			
	MEADOWS			
8.6.1	camp location in relation to			
	MICROTOX			
4.3.5.2	information			
	MINERAL DEPOSIT PROTECTION			
4.3.8.2	drilling operations			
	MINERAL RESOURCES			
8.3.2	quarries			
Appendix B	information on locations			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	MINERAL SURFACE LEASE			
2.3, 8.3.1 Table 2.3 Table 2.1	surface materials			
	MISCELLANEOUS LEASE			
2.3, Table 2.3 Table 2.1	gas plants			
	MONITORING			
5.3.9	production facilities, gas plants, batteries			
	MUNICIPALITIES			
Appendix A2	by-laws and requirements			
2.8, Appendix B	information			
	MUSKEG			
6.3.2.3	crossing - pipelines			
	NATIONAL ENERGY BOARD			
2.6	Acts			
	NATURAL REGIONS OF ALBERTA			
Appendix B	information			
	NATURAL RESOURCES INVENTORY INFORMATION INDEX			
Appendix B	information			
	NAVIGABLE WATERS			
2.6, Table 2.1	permit to cross			
	NESTING			
4.3.6	seasons			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	NOISE			
5.3.10	control of at a plant			
	OCCUPATIONAL HEALTH			
	guidelines	A.1.23		
	ODOURS			
5.3.9	control of at a plant			
	OIL			
5.3.6	storage of in pits	A.1.19(A)	9	8.010
5.3.12	spills to be reported	A.1.19(A)	14	8.050
4.3.5.2	toxicity of			
	OIL SANDS SITE			
7.0, 7.1	Development and Reclamation approval required to operate, alter or abandon	A.1.15(D) A.1.15(D)	1 3	3(3) 9(1)(2)(5)
7.3	guidelines			
	OIL SANDS SURFACE OPERATION			
	designation of	A.1.15(D)	1	3(1)
7.2.1	Exploration approval required	A.1.15(D)	1	3(2)
	OIL SPILL RESPONSE PLAN - see SPILL RESPONSE PLAN			
	OIL SUMPS			
4.3.5	for waste containment			
4.3.5	construction			
	OPERATION			
5.1 Tables 2.1 & 2.2	of a plant, licence required	A.1.4 A.1.3 A.1.3(A)	2 2 2	4(1)(2) 4(1) 7(1)

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
		A.1.19(A)	21	9.030(2)
Tables 2.1 & 2.2	alter operation of a plant - permit required	A.1.4	3	5(1)
			A.1.4(B)	
			3	14
	alter operation of a plant - licence required	A.1.3(A)	4	18(1)
5.1 Tables 2.1 & 2.2	of a plant - permit required	A.1.4(B)	2	8(1)
Table 2.2	of a plant - approval required	A.1.19(A)	20	9.020
	ORDER			
	Surface Disturbance Control order - Land Surface Conservation and Reclamation	A.1.15	4	28(1)(2)(3)
	anti - litter of issuance	A.1.16	8	7(2)
	emission control	A.1.3	6	13(1)
	ORGANIZATION CHARTS			
Figures 2.1, 2.2 2.3, 2.4	of government bodies			
3.1, 4.1, 5.1, 6.1, 6.1a, 7.1, 8.3.1	of application procedures			
	PARKS			
Appendix B	locations of			
	PERMAFROST			
Appendix B				
	PERMISSION			
2.5.1.3, 8.7.7.3	to discharge, deposit or drain into surface water, watercourse etc.	A.1.4(A)	1	11(1)
	PERMIT			
Tables 2.1, 2.2, 2.3 & 2.4	list of permits and definitions			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
2.3.1.2, 3.1	application for Exploration permit -	A.1.18(A)	7	7
3.2	geophysical	A.1.18(A)	8	8
Tables 2.1, 2.3 & 2.4				
Tables 2.1 & 2.2	to construct or alter	A.1.4	1	3(1)
	construction of a plant.	A.1.4	3	5(1)
		A.1.4(B)	3	14
		A.1.19(A)	21	9.030(1)
		A.1.3	1	3(1)
		A.1.4(B)	1	4(1)
		A.1.3(A)	3	13
		A.1.3	3	5(1)
		A.1.3(A)	1	3(1)
4.2	drilling			
Tables 2.1 & 2.2				
Table 2.4	to deposit deleterious substance in a watercourse, surface water etc.	A.1.4	6	17(2)
Table 2.4	to divert water	A.1.26	2	5(1)
5.2	production facilities			
6.2	pipeline	A.1.22(B)	1	2(1)(2)
Tables 2.1 & 2.3				
	for equivalent standard of safety -	A.1.8	2	5(1)
	transportation of dangerous goods	A.1.8(B)	2	12,18
	PERSONNEL TRAINING			
3.3.8	fire safety			
6.3.3, 8.9.3	contingency plans			
5.3.12, 8.9.3	spill response plans			
4.3.9	blowout prevention			
5.3.6, 6.3.5	operation and maintenance			
	PESTICIDES			
2.5.1.3	permit	A.1.1	1	5(1)
Tables 2.1 & 2.4				
Appendix D				
8.11	handling	A.1.1	1	5(1)

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	PHYSICAL			
Appendix B	environmental parameters			
	PIPELINE			
6.0	general			
Appendix B	existing infrastructure			
6.1	application procedure	A.1.22	2	8
2.2.1.4, 6.2 Tables 2.1 & 2.3 Appendix D	permits	A.1.22	2	8
2.5.1.1, 6.2 8.4.1	Development & Reclamation approval	A.1.15(E) A.1.15(E)	1 2	2(2) 4
6.3.5	operation and maintenance manual	A.1.22(B)	5	49
6.3.3, 8.4.3	leaks and breaks	A.1.22(B) A.1.22(B)	8 9	54 55
6.3.1	alignment			
6.3.2.4	timber clearing			
6.3.2.5	trenching, pipe laying, and grading			
6.3.2.5	erosion, drainage			
8.3	gravel and borrow pits			
6.3.2.9	stream crossings			
6.3.3	spill contingency plans			
Tables 2.1 & 2.3	surface rights			
Table 2.3	pipeline installation lease (PIL)			
6.3.4, 8.11	weed control			
6.3.4	right-of-way maintenance			
6.3.3	spill clean-up	A.1.22	4	37
2.7	interprovincial crossings			
2.7,6.3.1	crossings - permission			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
6.3.5	corrosion protection	A.1.22(B)	3	12
		A.1.22(B)	7	53
	PIPELINE SURFACE OPERATIONS			
6.1	designation of	A.1.15(E)	1	2(1)
	PITS			
5.3.6	storage of oil in	A.1.19(A)	9	8.010
4.3.5	specifications for storage or disposal of water from a well, battery or a plant	A.1.19(A)	13	8.040
4.3.5, 5.3.7, 8.7	specifications for storage of liquid waste			
	PLANNING			
4.3.1	location of well sites, access routes			
3.3.1	location of seimic lines			
8.1.2	access roads			
	PLANT			
2.2.1.1, 5.2 Tables 2.1 & 2.2	construction of - permit required	A.1.19(A)	24	9.030(1)
		A.1.3	1	3(1)
		A.1.4	1	3(1)
		A.1.3(A)	1	3(1)
2.2.1.1, 5.2 Tables 2.1 & 2.2	operation of - licence required	A.1.3	2	4(1)
		A.1.4	2	4(1)
		A.1.3(A)	2	7(1)
		A.1.4(B)	2	8(1)
		A.1.19(A)	24	9.030(2)
2.2.1.1	alter construction of - permit required	A.1.3(A)	3	13
		A.1.4(B)	3	14(1)
	alter operation of - licence required	A.1.3(A)	4	18
		A.1.4(B)	3	14(1)
	alter construction or operation of a plant - permit required	A.1.3	3	5
		A.1.4	3	5
		A.1.4(B)	3	14

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
5.3.6	firewall required	A.1.19(A)	11	8.030
	disposal of produced water from	A.1.19(A)	13	8.040
2.2.1.1, 5.2	approval to construct and operate	A.1.19(A)	23	9.020
5.3.9	discharge/disposal of hydrogen sulphide at	A.1.19(A)	26	9.050
5.3.9	control of emissions at	A.1.19(A)	26	9.050(6)
5.3.7, 8.7.2	disposal of wastewater from			
5.3.12, 8.9.2	emergency procedures for uncontrolled release of contaminants at	A.1.19(A)	27	9.060
5.2	gas processing - application	A.1.19(A)	28	15.050
	POLLUTION			
2.5.1.3, 5.3.9 7.3.3, 5.3.5 Table 5.2	air			
2.5.1.3, 8.7.7.3	water			
	POWERLINES			
Table 2.1 & 2.3	permits			
	PRECIPITATION			
Appendix B	data			
	PRELIMINARY PLAN			
	for exploration approval	A.1.18(A)	10	10
		A.1.18(A)	11	11
	PRODUCED WATER			
4.3.5.2, 7.3.4 7.3.5, 8.7.7.2	disposal			
	PRODUCTION FACILITIES			
5.1	application procedures			
5.2, 2.2.1.1	permits, approvals and licences			
5.3.1	site selection			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
5.3.3	site drainage			
5.3.5	pollution control			
5.3.6	product storage and handling			
5.3.7, 8.7.2	disposal			
5.3.9	emissions			
5.3.10	waterfloods			
5.3.11, 8.8	noise			
8.4	reclamation			
	PROVINCIAL PARKS			
Appendix B	identification			
2.3.1.1	Public Land Disposition (PLD)			
	RECLAMATION			
8.4	general			
8.4.1	for regulated operations			
8.4.2	in forested and non-forested areas	A.1.15	9	47(1)-(6)
8.4.1	plans required			
8.4.1.2	soil conservation			
3.3.12	of exploration activities			
8.4.2	at production facilities, gas plants and batteries			
8.4.2.1	of seismic lines			
8.4.2.1	of access roads			
8.4.1.1, 8.4.2	of pipelines			
8.4.1.2,	of sand and gravel operations			
8.4.1.3	of in situ projects			
8.4.2.1, 3.3.12	recontouring			
8.4.4	revegetation			
8.4	orders	A.1.15	8	42(1)
8.10.1	certificates	A.1.15	10	52(1)

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
8.4	techniques			
8.4	standards	A.1.15	7	38
	RECLAMATION CERTIFICATE			
8.10.1	regulatory process			
Tables 2.1 & 2.3	required to surrender Surface Lease or Right of Entry Order	A.1.15	10	52(1)
	appeal	A.1.15	11	60(1)(4)(5)
	RECLAMATION ORDER			
	appeal	A.1.15	11	60(4)(5)
	appeal to Court of Appeal	A.1.15	12	63
8.10.1	issuance of	A.1.15	8	42(1)-(4)
	RECLAMATION PLAN			
8.4.1	required for Development and Reclamation plan	A.1.15(B)	7	33(1)-(4)
	REFERRAL & APPLICATION SYSTEMS			
2.9	information			
	REGULATED SURFACE OPERATIONS			
2.5.1.1	designation of	A.1.15	3	23(1)(2)(3)
7.1	designation of - oil sands	A.1.15(D)	1	3(1)(2)(3)
6.1	designation of - pipeline	A.1.15(E)	1	2(1)(2)(3)
	REMOVAL			
5.3.8	of hydrogen sulphide at a plant	A.1.19(A)	26	9.050(5)
	REPORT			
8.4	Development - D&R Approval	A.1.15(B)	1	25
	Surface Disturbance - D&R Approval	A.1.15(B)	2	26

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
8.10, 8.3, 8.1	Reclamation report - Gravel and Borrow			
	Surface Water Management - D&R Approval	A.1.15(B)	4	28(1)(2)
	Groundwater Management - D&R Approval	A.1.15(B)	5	29(1)(2)
	to be filled with the Director of Forestry - oil sands	A.1.15(D)	7	16
	to be filed with Chairman of Land Conservation and	A.1.15(D)	8	17
	Reclamation Council (oil sands and pipeline)	A.1.15(E)	4	10(1)(2)
5.3.12, 8.4.3.1	spills of oil or salt water	A.1.19(A)	14	8.050
	RESERVES			
Appendix B	environmentally unique and protected			
	RESIDENTIAL AREAS			
4.3.1,5.3.1 Table 5.3	spacing guidelines for petroleum development			
	RESTRICTED DEVELOPMENT AREAS			
2.5.1.1	administration			
Figure 2.13	location of			
	REVEGETATION			
8.4.4	techniques			
8.5.2.7	for erosion control			
	RIG			
4.3.12	dismantling procedures and lease clean-up			
	RIGHT OF ENTRY			
	to historic sites	A.1.2	1	33(1)
	RIGHT OF WAY - PIPELINES			
6.3.2.1	width, buffer strips, archaeological resources, wildlife and habitat, sanctuaries			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
6.3.2.1	use of right-of-way			
6.3.4 8.11	maintenance and weed control			
	RIVER BASINS			
Appendix B	studies			
	ROADS (ACCESS)			
8.1	information			
8.1.3.1	maintenance guidelines			
8.1.2, 8.1.3	alignment, guidelines			
8.1.3, 8.2	crossings - streams			
6.3.2.2	crossings - pipelines			
8.1.3	dust control			
8.1.3.1	permanent			
8.1.3.2	temporary			
8.1.1	use of existing infrastructure			
8.1.2	route selection			
	ROADS			
8.2.2.5	corduroy			
Figure 8.2.2.5	use of and damage to in geophysical operations	A.1.18(A) A.1.18(A) A.1.18(A) A.1.18(A)	44 45 46 47	44 45 46 47
8.3.1.2	winter			
2.7	use agreements			
	RURAL RELATIONS			
2.10, 1.10.2 Appendix A2	information			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	SAFETY VALVES			
5.3.12	subsurface	A.1.19(A)	6	7.050(b)
	SALT WATER			
5.3.7.1, 5.3.12, 8.9.3	contingency plan			
5.3.12, 8.9.3	spill of to be reported	A.1.19(A)	14	8.050
4.3.5.3 8.7.7.2	disposal			
	SAND AND GRAVEL			
8.3	general			
Appendix B	inventory			
8.3 Figure 8.3.1	application procedures			
8.4.1.2	reclamation of operations			
	SEISMIC CUT LINES			
3.1	application procedures			
3.3.1	alignment, cutting procedures, buffer zones			
3.2	permits, licences and approvals			
3.3.3	debris and slash disposal			
3.3.2	cutting, clearing & timber disposal			
3.3.6	stream crossings			
3.3.12, 8.4	reclamation and abandonment			
	SENSITIVE AREAS			
Appendix B	locations			
	SEWAGE			
8.6.3.1	effluent objectives			
8.6.3.2	treatment			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	SHOT HOLES			
3.3.9	plugging, locations, flowing, abandonment			
Table 3.2	minimum allowable distances			
	SITE SELECTION			
4.3.1	drilling			
5.3.1, 7.3.1	production facilities			
8.6.1	camps			
	SLASH			
3.3.3, 4.3.12	disposal techniques			
	SLOPE STABILITY			
8.5.2.5	erosion control methods to maintain			
	SMOKE			
5.3.9	control at a plant	A.1.19(A)	26	9.050
	SMOKING			
3.3.8,4.3.3	fire prevention			
	SOCIO-ECONOMIC			
7.2.1	parameters			
	SOIL			
Appendix B	Alberta soil profiles (typical)			
Appendix B	maps and reports			
8.4.1.2	conservation methods			
8.5.2.6	stability and wind erosion			
Appendix B	Alberta index to soil surveys			
8.11.1	sterilants			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	SOLID WASTE			
5.3.7	production facilities			
4.3.4	drilling sites			
8.6.4	camps			
	SOUR GAS PLANTS			
5.1	application			
	SPACING			
4.3.1	well			
4.3.1, 5.3.1 Table 5.3	residential			
	SPILL			
8.9.3	of oil or salt water	A.1.19(A)	14	8.050 8.060 8.070 8.051
5.3.12, 8.9 6.3.3	contingency (and spill response) plans			
8.4.3, 6.3.3	clean-up - pipelines	A.1.22	4	37
8.4.3	reclamation			
	SPILL PREVENTION			
4.3.3, 3.3.8, 5.3.6	fuel storage			
5.3.12	techniques			
5.3.12	employee training			
5.3.12	maintenance and equipment testing			
	SPILL RESPONSE PLAN			
5.3.12, 8.9 6.3.3	purpose and objectives			
5.3.12, 8.9	requirements			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
6.3.3				
	STOP ORDER			
	oil sands site	A.1.21	3	9
	construction or operation of a plant	A.1.3	7	14(2)
		A.1.4	4	15
	appeal of	A.1.4	5	15(7)
		A.1.3	8	14(7)
		A.1.6	2	17(7)
		A.1.15	2	9(7)
	Appeal Regulations	A.1.15(A)		
	appeal - respecting - Form A	A.1.3(B)		
	Ministerial discretion	A.1.6	1	17(1)
		A.1.15	2	9(1)
	transportation of dangerous goods	A.1.8	4	12(1)
		A.1.8(B)	1	3(1)
	STORAGE			
5.3.6	of oil	A.1.19	9	8.010
	of produced water from a well, battery or plant	A.1.19(A)	13	8.040
4.3.5	of liquid waste from a well see UNDERGROUND STORAGE	A.1.19(A)	18	8.150
	STREAM			
3.3.6, 8.2 6.3.2.9	crossings			
2.5.1.2, 8.2.2.7 Figure 2.6	application approval procedure			
8.3	channel clean-up			
8.7.7.3	deposition of deleterious materials			
2.5.1.2 Tables 2.1 & 2.4	licences, permits and approvals required for crossing			
8.2.2.7	pipeline crossings			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
8.2.2.8	construction scheduling for crossings			
8.2.2.10	habitat protection for crossings			
8.2.2.9	disposal of excavated material			
8.2.2.11	maintenance			
	SUBSURFACE			
8.7.7.2	discharge			
Appendix B	quality			
	SULPHUR DIOXIDE			
5.3.9	monitoring			
	SULPHUR			
5.3.8	handling			
	SUMP			
4.3.5	fluid control			
4.3.5	construction, location			
	SURFACE DISTURBANCE CONTROL ORDER			
	for regulated surface operations	A.1.15	4	28(1)(2)(3)
	SURFACE DISTURBANCE REPORT			
	required for Development and Reclamation plan	A.1.15(B)	2	26
	SURFACE LEASE			
8.10	surrender not binding without Reclamation Certificate			
	SURFACE RIGHTS			
2.3.1.1 Tables 2.1 & 2.3	leases and permits			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
2.3.1.1 Appendix D	applications for			
Tables 2.1 & 2.3	right of entry board			
	SURFACE WATER			
	management report - required for Development and Reclamation plan	A.1.15(B)	3	28
Appendix B	resources			
5.3.3, 7.3.6 8.7.7.3	discharges into			
Appendix B	quality			
	SURVEY			
8.1.3	access roads			
6.3.2.1	pipelines			
	TANKS –			
	see PRODUCTION STORAGE TANKS			
	TIMBER			
3.3.2, 4.3.2 5.3.2, 6.3.2.4	clearing	A.1.13(B)	1	146-151
	damage, compensation	A.1.13(B)	1	146-151
	TIMING CONSTRAINTS			
3.3.7, 4.3.6 8.2.2.8, 6.3.2.3 Table 8.2.2	for habitat protection			
	TOPOGRAPHY			
Appendix B	maps of			
	TOPSOIL			
8.4.2.2, 6.2.3.5	protection, restoration			
4.3.1, 8.4	removal, replacement			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
3.3.5, 8.5	soil erosion			
8.4.4.1	rebuilding			
	TOXIC MATERIALS			
8.7.2	see **HAZARDOUS WASTES**			
	TRAILS			
Appendix B	information			
	TRANSBOUNDARY			
2.6	regulations			
	TRANSFER			
	Exploration or Development and Reclamation approval - consent required	A.1.15(B)	9	42(1)(2)(3)
	TRANSMISSION LINES			
Appendix B	Infrastructure			
	TRANSPORTATION			
8.7.2	of dangerous goods	A.1.8 A.1.8(A) A.1.8(B)		
	TRAPLINE			
3.3.1, 2.7, 6.3.2.2	notification			
Appendix B	information			
3.3.1	activity			
	TREE FREEING			
Table 2.3	authority			
	TRENCHING			
6.3.2.5	pipelines			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	UNDERGROUND STORAGE			
	application for approval of	A.1.19(A)	29	15.060
	VAPOURS			
5.3.9	control of at a plant	A.1.19(A)	23	9.050
	VEGETATION			
8.4.4	sensitive areas			
Appendix B	maps and reports			
Appendix B	major types (in Alberta)			
8.11	control of, herbicides			
8.4.2.1, 8.4.4	revegetation			
	VEHICLES			
8.6.1	movement limitations at camps			
8.2.1	movement limitations at stream crossings			
Table 8.2.2	crossing methods			
	VENTING			
5.3.6	equipment			
	WASTE DISPOSAL			
3.3.11	exploration			
4.3.4, 4.3.5	drilling			
5.3.7, 7.3.2	production facilities			
8.6, 8.6.3	at camp sites			
8.7	general			
	WASTE MATERIAL			
4.3.4, 4.3.5, 5.3.7	disposal of, from well or battery site	A.1.19(A)	18	8.150

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	WATER			
	defined	A.1.26	1	(v)
2.5.1.2 Table 2.4	licence or permit required to divert	A.1.26	2	5
Appendix D	application for licence to divert water - Form 1			
8.6.2	supply, potable			
	disposal of produced water from well, battery or plant	A.1.19(A)	13	8.040
2.5.1.2, Appendix B	quality			
Appendix B	Survey of Canada			
6.3.2.6	testing with (pipelines)			
	WATER CROSSING			
3.3.6	seismic activities			
4.3.6	drilling activities			
6.3.2.9	pipelines			
8.2	general guidelines			
	WATER RESOURCES			
	act	A.1.26		
2.5.1.2	Management Services (Alberta Environment)			
4.3.8.1	conservation and protection			
Appendix B	existing in Alberta			
Appendix B	quality of			
4.3.8.1	preventing pollution of			
Appendix B	surface water			
Appendix B	information			
4.3.8.1	groundwater protection			
2.5.1.2 Table 2.4	permits			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	WEATHER			
Appendix B	observation stations			
Appendix B	historical records			
	WEED			
6.3.4, 8.11	control, chemicals, spraying			
	WELL			
2.2.1.1, 4.1 Figure 4.1	drilling application procedure			
	disposal of produced water from	A.1.19(A)	13	8.040
4.3.12	disposal of liquid waste and debris upon abandonment	A.1.19(A)	18	8.150
4.3.4, 4.3.5	disposal of waste material from	A.1.19(A)	18	8.150
	drilling, completing and servicing	A.1.19(A)	2	6.050
7.3.5	casing and equipment	A.1.19(A) A.1.19(A)	3 4	6.080 6.100
Table 2.1, 2.2	spacing units permit			
Table 2.1, 2.2	special wells			
	WELL ABANDONMENT			
Table 2.2	abandonment permit			
4.3.11	casings			
4.3.11 Table 2.2	plugging back			
	WILDLIFE			
2.6	Act (Federal)			
4.3.6	harassment			
Appendix B	data on endangered species			
Appendix B	critical habitat areas			
Appendix B	land reserves			

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
3.3.7, 4.3.6, 5.3.4, 6.3.2.3	concerns			
3.3.7	and exploration activities			
4.3.6	and drilling activities			
5.3.4	and production activities			
6.3.2.3	and pipeline activities			
3.3.7, 4.3.6 6.3.2.3, 8.2.2.6.5, 8.2.2.8 Table 8.2.3	critical time periods			

CONCORDANCE EXAMPLE

CONCORDANCE

OPERATING GUIDELINES	KEY WORD	ENVIRONMENTAL LEGISLATION		
Text Section		Act Number	Page Section Number	Legislation Section
	CONSTRUCTION			
2.2.1, 5.1, 5.2 Tables 2.1, 2.2 Figure 5.1	of a plant, permit required	A.1.3 A.1.3(A) A.1.4 A.1.4(B)	1 1 1 1	3 (1) 3 (1) 3 (1) 4 (1)

A.1.3. THE CLEAN AIR ACT

The following excerpts from The Clean Air Act and corresponding Regulations are environmentally oriented and applicable to the oil and gas industry.

1. **Construction Permit – Section 3**

(1) Subject to the regulations, no person shall commence or continue the construction of

(a) a plant for the manufacture of petroleum products, natural gas products, chemical and allied products, pulp and paper products, stone, clay or glass products, cement and lime products, fertilizers or animal by-products.

(b) a plant for primary metal production, metal processing, the processing of wood or wood products, the processing of coal, the processing of natural gas or its derivatives, the production and processing of inorganic chemicals, the manufacture of asphalt or ready-mixed concrete, gravel crushing or meat packing.

APPENDIX H
ABBREVIATION
KEY

Abbrev	Full Name
AE	Alberta Environment
AEn	Alberta Energy
AF & WD	Alberta Fish and Wildlife Division
AFLW	Alberta Forestry, Lands and Wildlife
AFS	Alberta Forest Service
AGT	Alberta Government Telephones
Al_2O_3	Aluminum Oxide
ALI	Alberta Land Inventory
AMD	Air Monitoring Directive
ANSI	American National Standards Institute
AOSTRA	Alberta Oil Sands Technology and Research Authority
API	American Petroleum Industry
AR	Alberta Regulation
ATV	All Terrain Vehicle
B.O.D.	Biochemical Oxygen Demand
BDY	Boundary
C/N	Carbon/Nitrogen Ratio
C/P	Carbon/Phosphorus Ratio
CEP	Coal Exploration Program
CLI	Canada Land Inventory
CO_2	Carbon Dioxide
CPA	Canadian Petroleum Association
$Ca(OH)_2$	Hydrated Lime (Calcium Hydroxide)
$CaCO_3$	Ground Limestone (Calcium Carbonate)
$CaCI_2$	Calcium Chloride
Cd	Cadmium
Cr	Chromium
D & R	Development and Reclamation
dB	Decibel
dBALeq	A Weighted, Continuos Energy Equivalent Sound Level
dBH	Decibel Hours
DEA	Diethylamine
DEG	Diethylene Glycol
DIAND	Department of Indian Affairs and Northern Development

DIPA	Diisopropylamine
DND	Department of National Defense
DRS	D-Reservation
EARP	Environmental Assessment Review Process- Federal
ECA	Environmental Council of Alberta
EG	Ethylene Glycol
EIA	Environmental Impact Assessment-Provincial
EPS	Environmental Protection Service
EPZ	Emergency Planning Zone
ERCB	Energy Resources Conservation Board
ERP	Emergency Response Plan
EZE	Easement
FMA	Forest Management Agreement
FeS	Troilite (Ferrous Sulphide)
FeS_2	Pyrite (Ferric Sulphide)
Fe_2O_3	
H.E.L.P.	Help Eliminate Landfill Pollution
H_2S	Hydrogen Sulphide
Hg	Mercury
I.D.	Improvement District
ID	Interim Directive
IEC	International Electrotechnical commission
IEI	Initial Environmental Investigation
IL	Informational Letter
ISO	International Organization for Standardization
K	Potassium
KCL	Potassium Chloride
LOC	License of Occupation
LPG	Low Pressure Gas
LSCR	Land Surface Conservation and Reclamation
LTO	Land Titles Office
LUO	Land Use Officer
La	Lanthanum
M.D.	Municipal District

MEA	Methylethylamine
MLL	Miscellaneous Lease
MLP	Miscellaneous Permit
MSL	Mineral Surface Lease
MTL	Miscellaneous Townsite
MTS	Miscellaneous Townsite Lease
N.T.S.	Not To Scale
NALRD	Northern Alberta Land Registration Division (north of Township 34)
NO_x	Nitrogen Oxides
NTS	National Topographical System
Na	Sodium
Na_2O	Sodium Oxide
NaCL	Sodium Choride
Ni	Nickel
N_2	Nitrogen
OSE	Oil Sands Exploration Program
P & NG	Petroleum and Natural Gas
P.F.R.A.	Prairie Farm Rehabilitation Association
PCB	Polychlorinated Biphenyl
PIL	Pipeline Installation Lease
PITS	Petroleum Industry Training Service
PLA	Pipeline Agreement
PLS	Public Land Sale
PPB	Parts Per Billion
PPM	Parts Per Million
PSA	Private Surface Agreement
PVA	Polyvinyl Acetate
Pb	Lead
R/W or ROW	Right-of-way
RDA	Restricted Development Area
REA	Rural Electrification Association
REC	Recreational Lease
RFR	Restricted Forest Reserve
ROE	Right of Entry

S	Sulphur
SALRD	Southern Alberta Land Registration Division (south of Township 34)
SAR	Sodium Adsorption Ratio
SHLL	Staff Housing Land Lease
SMC	Surface Materials License
SML	Surface Materials Lease
SO_4	Inorganic Sulphur (Sulphate)
SO_2	Sulphur Dioxide
SRB	Surface Rights Board
SRPU	Surface Rights Plotting Unit
TEA	Triethylamine
TEG	Triethylene Glycol
TiO_2	Titanium Dioxide
T.S.P	Total Suspended Particles
T.S.S.	Total Suspended Solids
U.S.E.P.A.	United States Environmental Protection Agency
V	Vanadium
VFR	Visual Flight Role